INSTRUCTION MANUAL

MI24-71X

INSTRUCTION MANUAL
FOR
CISPR/ANSI ADAPTER
MODEL CCA-7

MANUAL NO. 1-500783-326

EATON Advanced Electronics

Eaton Corporation
Electronic Instrumentation Division
Los Angeles, California 90066

AILTECH Instruments

INSTRUCTION MANUAL
FOR
CISPR/ANSI ADAPTER
MODEL CCA-7

MANUAL NO. 1-500783-326

(For use with serial numbers 101 and above.)

1st Print

Eaton Corporation
Electronic Instrumentation Division
Los Angeles Plant
5340 Alla Road
Los Angeles, California 90066

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3. Description of trouble[1]
4. Approximate date instrument was placed in operation.
5. Approximate number of hours in use.
6. Maintenance action previously requested or performed.
7. Other comments.

[1] Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken and any other relevant data.

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Figure 1-1. CISPR/ANSI Adapter
Model CCA-7

Section I

INTRODUCTION

1.1 SCOPE OF MANUAL

The manual provides operation and maintenance information for the programmable Model CCA-7 CISPR/ANSI Adapter (Figure 1-1) used in conjunction with the NM-17/27 and NM-37/57 EMI/FI Meters. The manual is divided into ten sections: Introduction; Specifications; Controls, Switches, Indicators and Receptacles; Installation; Operating Instructions; Theory of Operation; Minimum Performance Procedures; Maintenance; Replaceable Parts; and Schematic Diagrams.

1.2 PURPOSE AND USE OF EQUIPMENT

The CCA-7 CISPR/ANSI Adapter expands the capability of the VII Series EMI/FI Meters to make measurements in compliance with the publication of the Comite International Special des Perturbations Radioelectriques (CISPR) and of the American National Standards Institute (ANSI). Since the Verband Deutscher Elektrotechniker (VDE) has adopted the CISPR specifications, the CCA-7 can also be used to make measurements according to the VDE specifications. The national interference limits of various countries as listed in CISPR Publication 9 are also based on the CISPR specifications; therefore the CCA-7 can be used to check compliance with these national limits. All these specifications require the measurement of the quasi-peak (QP) value of radio frequency interference.

The significance of the quasi-peak value of radio frequency interference is documented in CISPR Publication 1, which states that the QP value provides an objective measure of the effect of an interference on the reception of radio telephony. This statement applies particularly for repetitive pulses, which

represent the majority of radio frequency interferences.

In the military EMI instrumentation based on MIL-STD 461, 462, peak detectors and average (FI) detectors are used, which are available in all VII Series EMI/FI Meters. In the commercial EMI instrumentation, however, applied to test electrical appliances, ignition systems, radio and TV receivers, etc., the QP detector according to CISPR and ANSI specifications is firmly entrenched.

The VII Series equipments contain QP detectors with the specified time constants, but, mainly because they are connected to logarithmic IF amplifiers, they do not meet the CISPR pulse response specifications as shown in Appendix B. The use of the CCA-7 CISPR/ANSI Adapter connected to the NM-17/27 and NM-37/57 EMI/FI Meters provides QP measurements according to the CISPR or ANSI specifications.

The CCA-7 covers the entire frequency range of 10 kHz to 1000 MHz divided in three sections. Table 1-1 shows the applicable CISPR publications and ANSI specifications in the three frequency ranges.

Table 1-1. Applicable Publications

Frequency Range	10-150 kHz	0.15-30 MHz	30-1000 MHz
CISPR Publication	#3	#1	#2 and #4
ANSI Specification	C63.2A	C63.2B	C63.3

The CCA-7 is connected to the rear panel mounted IF OUTPUT receptacle of the NM-17/27 and NM-37/57 EMI/FI Meters without affecting the operation of those equipments. Consequently, the CISPR or ANSI QP reading of a signal can be taken on the CCA-7 simultaneously with the PEAK or FI reading on the corresponding EMI/FI Meter. The Y Output of the CCA-7 can be utilized to plot the CISPR or ANSI QP level of any selected band of the EMI/FI Meters, using the internal scan

(or scan control from the programmer when operated in REMOTE position) available in those equipments.

1.3 GENERAL DESCRIPTION

The programmable CISPR/ANSI Adapter CCA-7 can be used directly with the NM-17/27 and NM-37/57 EMI/FI Meters when operated in the LOCAL mode or operated in the REMOTE mode when controlled by the CP-7 Programmer. The CCA-7 Output Meter provides a choice of linear or logarithmic scales, selected by the LIN/LOG toggle switch in LOCAL mode of operation or by the Programmer in REMOTE mode of operation. Linear and logarithmic video amplifiers are used to obtain the two types of scales. Connecting the meter to the linear amplifier results in a dB scale compressed at the low end and expanded at the high end of the scale. Connecting the meter to the log amplifier results in an approximately evenly distributed dB scale over a 40 dB dynamic range. In the 10-150 kHz and in the 0.15-30 MHz frequency ranges the linear scale covers 0 to +20 dB referred to 1 μV and the log scale -20 dB to +20 dB dynamic range. In the 30-1000 MHz range, the linear scale covers 0 to +10 dB referred to 1 μV and the log scale -30 dB to +10 dB dynamic range. The dB Meter scale in use is indicated by light emitting diodes (LED's) at the ends of the scale.

The Y OUTPUT on the rear panel of the CCA-7 is connected to the log video amplifier when one of the LOG scales is selected and to the linear video amplifier when one of the LINEAR scales is selected.

The three frequency ranges of the CCA-7 are selected by the FREQUENCY RANGE switch on the front panel. Each range has CISPR and ANSI positions and each range has its own calibration control.

To extend the dynamic range of the CCA-7, a 10 dB step attenuator is provided. The purpose of the -20 dB to +50 dB ATTENUATOR is to obtain an on-scale reading on the CCA-7 meter with CW signals or pulses of any repetition rate, when the dB meter of the corresponding EMI/FI Meter deflects between 30 and 60 dB. The last position of the ATTENUATOR switch is used for calibration. A 5 dB attenuator operated by a toggle switch can be used to obtain meter deflection in the upper 5 dB range of the linear meter scale.

The CCA-7 is operated by its own power supply, connected to a 115-230V, 50-400 Hz power line. It can be operated on a bench or can be mounted in a 19-inch standard rack.

1.4 SUPPLIED ACCESSORIES

The items listed in Table 1-2 are furnished with the CCA-7 CISPR/ANSI Adapter.

Table 1-2. Supplied Accessories

Quantity	Description	AILTECH Part No.
1	AC Power Cable 7-1/2 ft.	1-910166-001
2	IF Cable	2-004834-001
2	Rack Mounting Brackets	3-103895-001
4	Flathead Screws 10-32 x 3/8	1-964064-263
1	Instruction Manual	1-500783-326

1.5 ACCESSORIES NOT SUPPLIED

A Model 94595-1 Programmer cable is required when the CCA-7 is to be operated remotely by the CP-7 Programmer. The 94595-1 is a 6-foot cable with 41-pin connectors.

Section II

SPECIFICATIONS

2.1 INTRODUCTION

This section contains specification information for the CCA-7 CISPR/ANSI Adapter.

2.2 SPECIFICATIONS

Table 2-1 contains specification data for the Model CCA-7 when connected to the IF Output of the NM-17/27 and NM-37/57 EMI/FI Meters. Figures 2-1, 2-2 and 2-3 show typical broadband sensitivity curves.

Table 2-1. Specifications

Frequency Range / Characteristic	10-150 kHz CISPR	10-150 kHz ANSI	0.15-30 MHz CISPR	0.15-30 MHz ANSI	30-1000 MHz CISPR	30-1000 MHz ANSI	Tol.
Bandwidth, 6 dB:	200 Hz	200 Hz	8.9 kHz	8.9 kHz	120 kHz	120 kHz	±10%
Detector charge time constant:	45 msec.	1 msec.	1 msec.	1 msec.	1 msec.	1 msec.	±20%
Detector discharge time constant:	500 msec.	600 msec.	160 msec.	600 msec.	550 msec.	600 msec.	±20%
Meter mechanical time constant:*	160 msec.	160 msec.	160 msec.	160 msec.	100 msec.	100 msec.	±20%
Pre-detection overload factor (min.):	24 dB	24 dB	30 dB	30 dB	43.5 dB	43.5 dB	
Post-detection overload factor (min.):	6 dB	6 dB	12 dB	12 dB	6 dB	6 dB	
Connected to EMI/FI Meter:	NM-17/27				NM-37/57		
Intermediate Frequency:	455 kHz				20.5 MHz		
EMI/FI Meter Bandwidth:	10 kHz				1.0 MHz		
EMI/FI Meter IF Output nom:	100 mV rms				25 mV rms		
Meter Scales:	20 dB Linear, and 40 dB Log				10 dB Linear, and 40 dB Log		
Repetition rate restriction:	None				PRF >5 above 450 MHz		
Attenuator:	-20 to +50 dB in 10 dB steps and 5 dB						
Y Output:	1.0 V across 1 kΩ load at full-scale meter deflection						
CW signal reading accuracy:	±2 dB	±2 dB	±2 dB	±2 dB	±2 dB	±2 dB	
Reference PRF for pulse response:	25	25	100	100	100	100	
Spectral intensity at the reference PRF for a QP response which is equal to 10 µV CW response:	100 dBµV/MHz	95** dBµV/MHz	67 dBµV/MHz	64 dBµV/MHz	50 dBµV/MHz	50 dBµV/MHz	±1.5 dB
PRF	Relative input level for constant indication.						
10^3	---	---	-4.5 dB	-2 dB***	-8 dB	-7.5 dB	±1 dB
100	-4 dB	-1 dB	0	0	0	0	±1 dB
25	0	0	+5.5 dB	+2.8 dB***	+8 dB	+7 dB	±1 dB
10	+4 dB	-0.5 dB**	+10 dB	+5.5 dB***	+14 dB	---	±1.5 dB
2	+13 dB	+2.5 dB**	+20.5 dB	---	+26 dB	---	±2 dB
1	+17 dB	+3.5 dB**	+22.5 dB	---	+28.5 dB	---	±2 dB
Isolated pulse	+19 dB	---	+23.5 dB	---	+31.5 dB	---	±2 dB
Response curve, see Appendix Figure:	A-2.	---	A-3.	A-5.	A-4.	A-6.	
CW Sensitivity:	0.03 µV		0.2 µV		0.64-1.4 µV		
Impulse Sensitivity versus PRF (typical), see Figure:	2-1		2-2		2-3		
AC power requirements	105 to 125 V or 210 to 250 V, 50 to 400 Hz, approximately 12 watts.						
Dimensions:	Height: 15.2 cm (6"). Width: 42.4 cm (16.7"). Depth: 47 cm (18.5").						
Weight:	Approximately 10 kg (22 pounds).						
Temperature Range	Operating: -15°C to +50°C (+5°F to +123°F).						
	Storage: -50°C to +75°C (-58°F to +167°F).						
Vibration:	Meets MIL-T-2100. Class 3 non-operating.						
Altitude:	Operating to 4.570m (15,700 ft.) above sea level.						

*According to CISPR specification, the time to reach 35% of the steady deflection.
**Not specified by ANSI.
***Specified at 1 MHz.

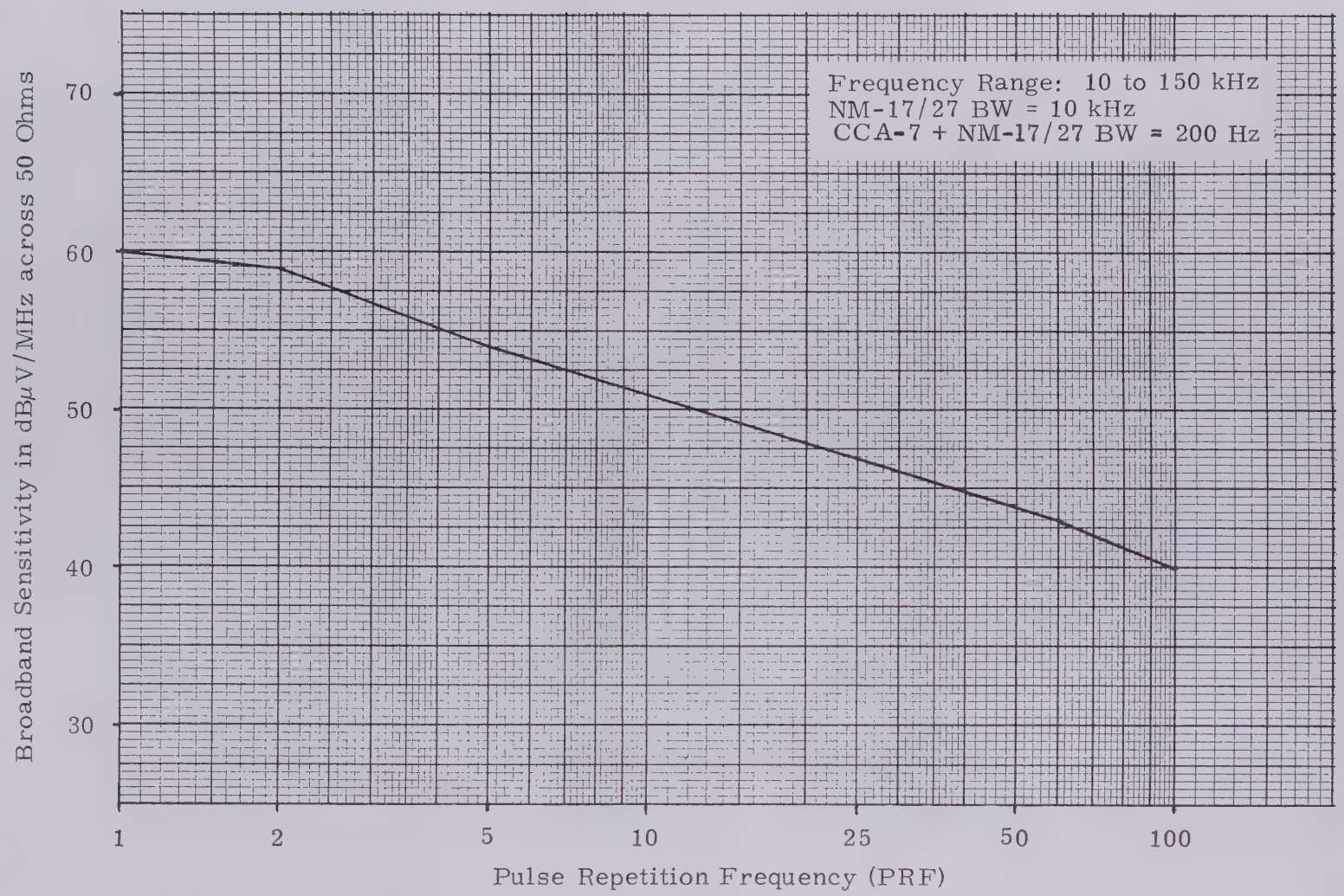


Figure 2-1. Typical Broadband Sensitivity of Model NM-17/27 Connected to Model CCA-7 CISPR/ANSI Adapter

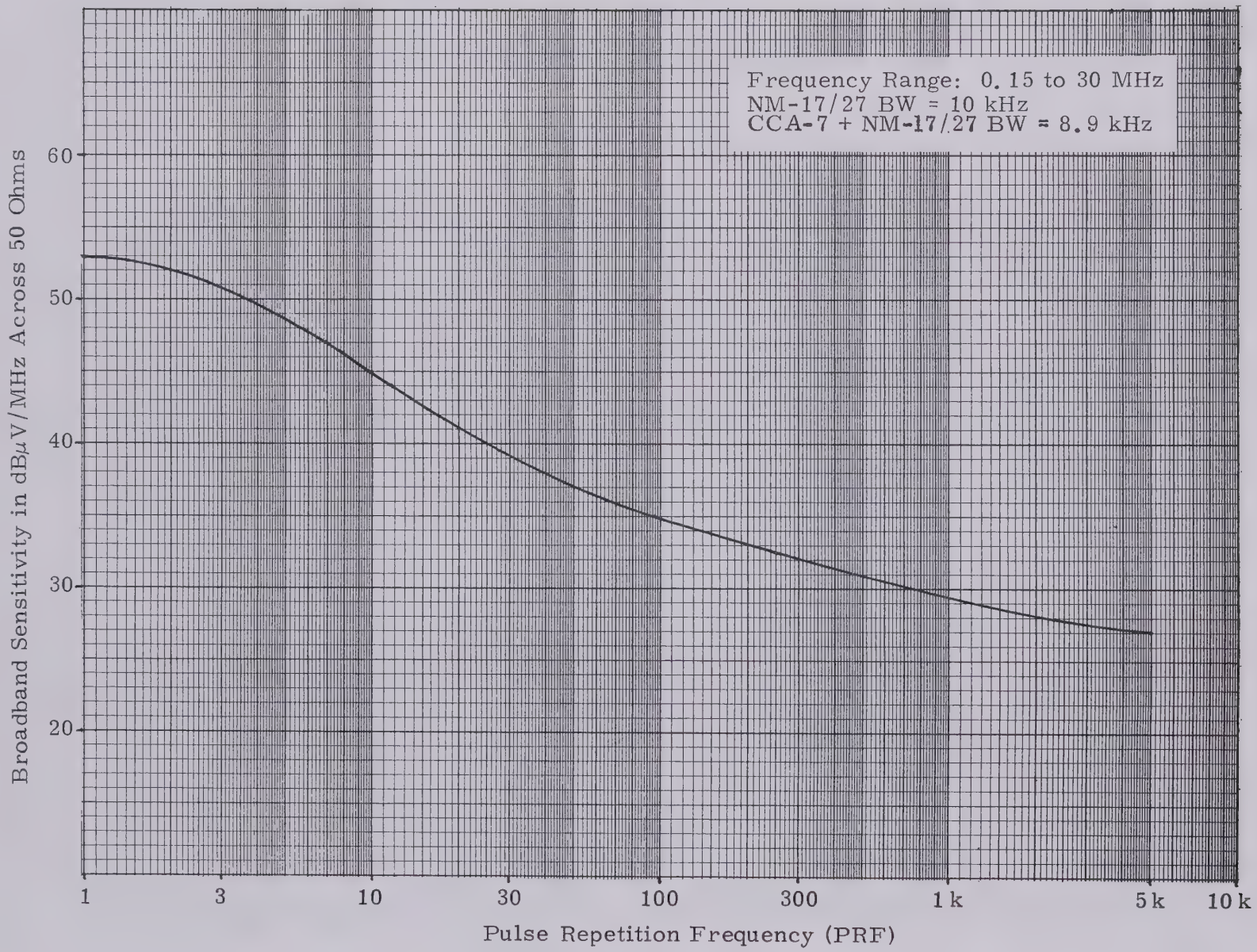


Figure 2-2. Typical Broadband Sensitivity of Model NM-17/27 Connected to Model CCA-7 CISPR/ANSI Adapter

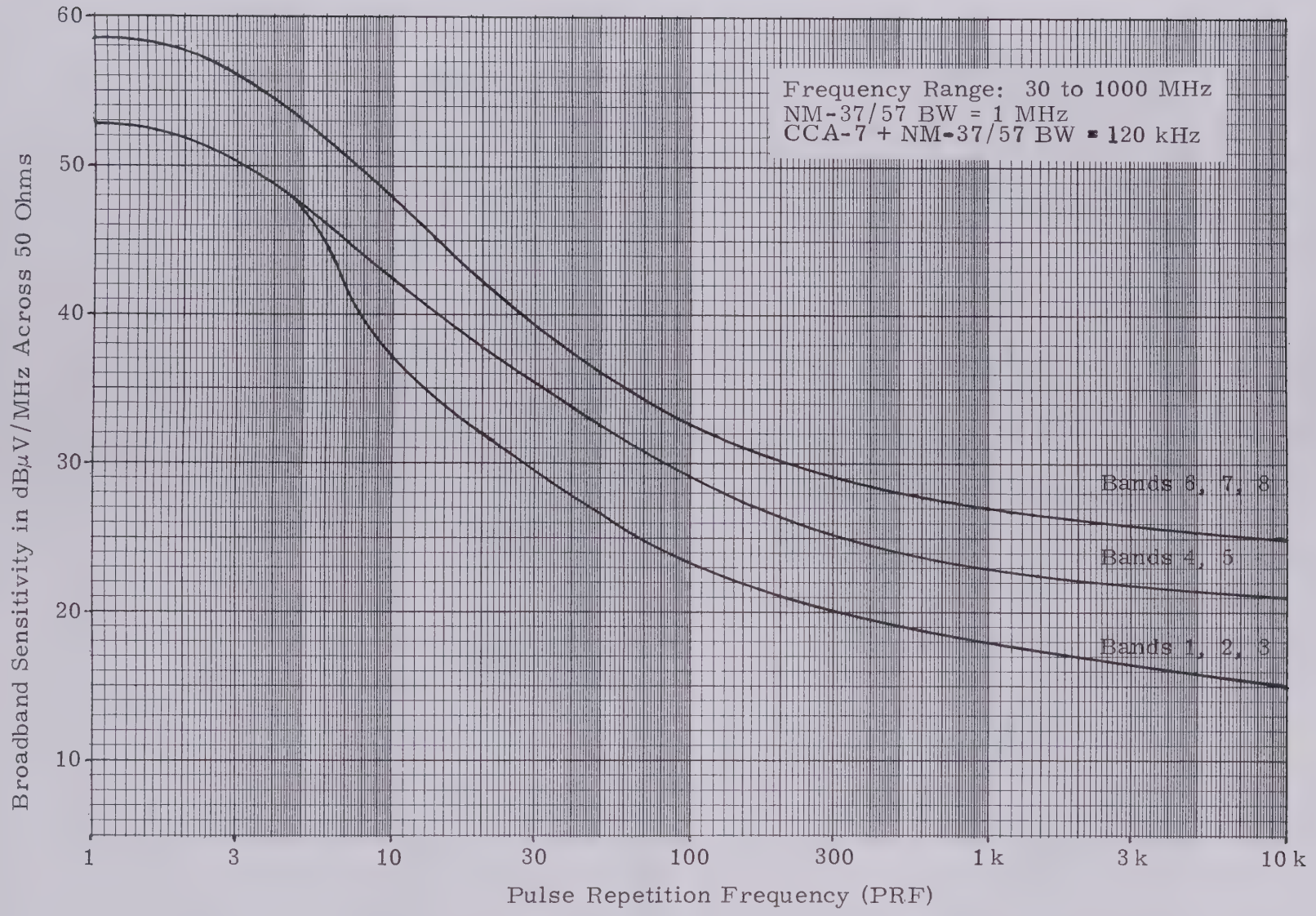


Figure 2-3. Typical Broadband Sensitivity of Model NM-37/57 Connected to Model CCA-7 CISPR/ANSI Adapter

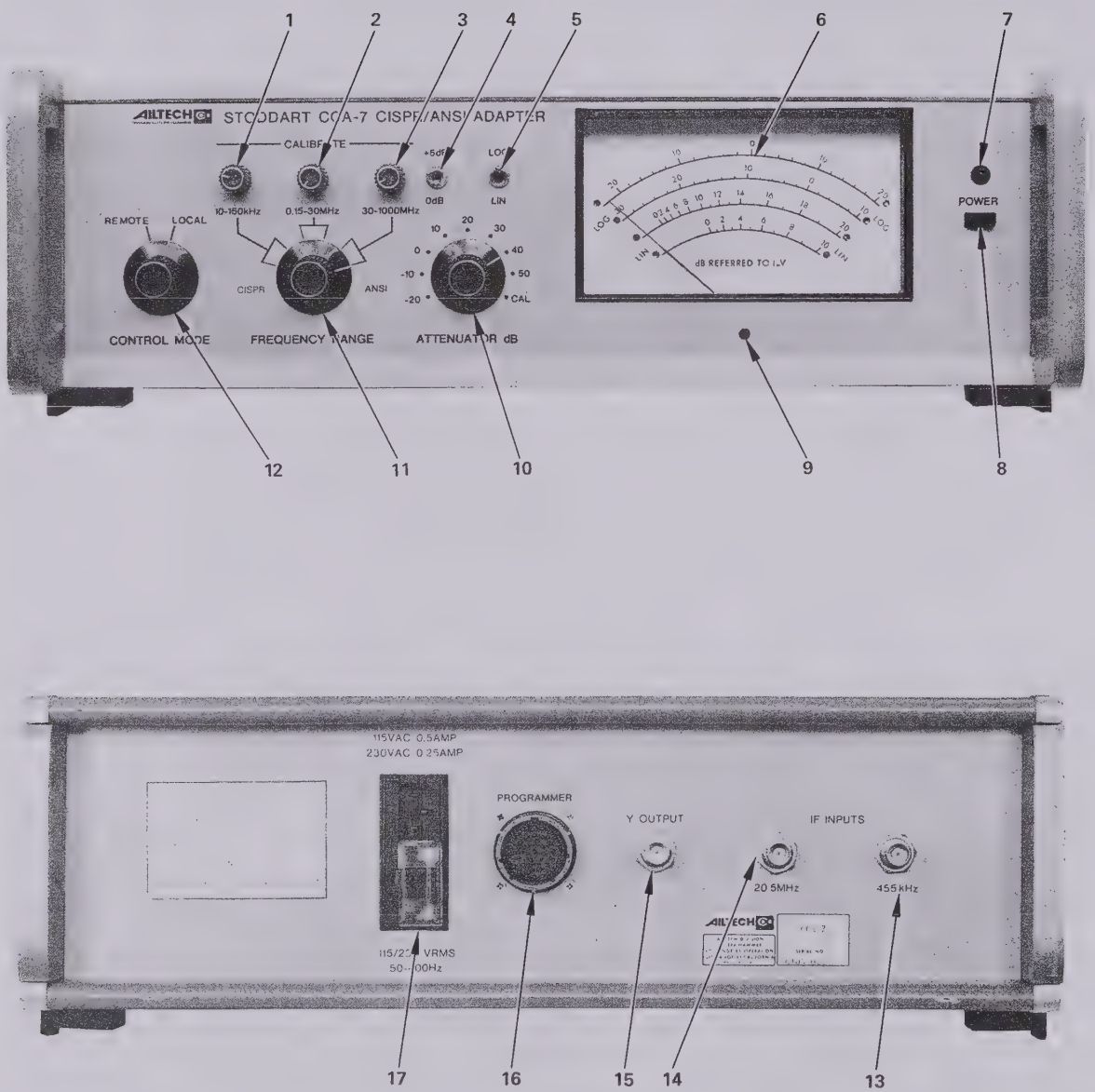


Figure 3-1. Controls, Switches, Indicators, and Receptacles, Model CCA-7

Section III

CONTROLS, SWITCHES, INDICATORS AND RECEPTACLES

3.1 INTRODUCTION

This section contains functional descriptions of all controls, switches, indicators and receptacles for the Model CCA-7.

3.2 CONTROLS, SWITCHES, INDICATORS AND RECEPTACLES

All external controls, switches, indicators and receptacles of the Model CCA-7 are located on the front and back panels (refer to Figure 3-1). The controls, switches, indicators and receptacles are identified by number in Figure 3-1 and their function described in Table 3-1. Pin data information for the PROGRAMMER receptacle (J5) is provided in Table 3-2.

Table 3-1. Controls, Switches, Indicators, Receptacles

Item	Panel Marking	Description	Function
1	CALIBRATE 10-150 kHz	Variable Resistor (AJA1/R75)	Provides gain adjustment in the 10-150 kHz freq. range.
2	CALIBRATE 0.15-30 MHz	Variable Resistor (A1A1/R45)	Provides gain adjustment in the 0.15-30 MHz freq. range.
3	CALIBRATE 30-1000 MHz	Variable Resistor (A1A1/R12)	Provides gain adjustment in the 30-1000 MHz freq. range.
4	+5 dB/0 dB	Toggle Switch (S4)	Provides 5 dB or 0 dB attenuation, LOCAL operation only
5	LOG/LIN	Toggle Switch (S5)	Selects logarithmic or linear dB Meter scales.
6	dB REFERRED to 1 μV	Meter (M1)	Displays two 40 dB logarithmic scales; one 20 dB and one 10 dB linear scale.
7	POWER	Indicator Light (CR9)	Indicates that the CCA-7 is turned on.

Table 3-1. Controls, Switches, Indicators, Receptacles (Continued)

Item	Panel Marking	Description	Function
8	POWER	Pushbutton switch	Turns CCA-7 on and off
9	-	Screwdriver adjustment	Provides the means of mechanical zeroing of the dB Meter
10	ATTENUATOR dB -20, -10, 0, 10, 20, 30, 40, 50, CAL	9 position rotary switch (A1/S3)	Provides selection of -20 to +50 dB attenuation in 10 dB steps and permits calibration in the selected frequency range.
11	FREQUENCY RANGE	6 position rotary switch (A1/S2)	Provides selection of frequency range and signal measurements according to CISPR or ANSI specs.
12	CONTROL MODE REMOTE/LOCAL	2 position rotary switch (A1/S6)	Provides means for REMOTE or LOCAL operation of the CCA-7.
13	IF INPUT/455 kHz	BNC receptacle (J1)	Provides IF input in the 10-150 kHz and 0.15-30 MHz frequency ranges.
14	IF INPUT/20.5 MHz	BNC receptacle (J2)	Provides IF input in the 30-1000 MHz frequency range.
15	Y OUTPUT	BNC receptacle (J3)	Provides a dc voltage representing the signal level in dB.
16	PROGRAMMER	41 pin connector (J5)	Provides connection for remote control of CCA-7.
17	115 VAC 0.5 AMP 230 VAC 0.25 AMP 115/230 VRMS 50-400 Hz	Power connector assembly (J4)	Provides the means to set and fuse the CCA-7 power supply for 115 V or 230 V ac power line.

Table 3-2. PROGRAMMER Receptacle Pin Data (J5)

PIN	FUNCTION
A	Ground closure to select 10-150 kHz frequency range, CISPR detector
B	Ground closure to select 10-150 kHz frequency range, ANSI detector
C	Ground closure to select 0.15-30 MHz frequency range, CISPR detector
D	Ground closure to select 0.15-30 MHz frequency range, ANSI detector
E	Ground closure to select 30-1000 MHz frequency range
F	Ground closure to select -20 dB Attenuation
G	Ground closure to select -10 dB Attenuation
H	Ground closure to select 0 dB Attenuation
J	Ground closure to select +10 dB Attenuation
K	Ground closure to select +20 dB Attenuation
L	Ground closure to select +50 dB Attenuation
M	Ground closure to select +40 dB Attenuation
N	+12 V output
P	Ground closure to select +30 dB Attenuation
Y	Linear Data output
Z	Log Data output
a	Ground closure to select Log meter scale
b	Ground closure to select Lin meter scale
e	Y Output (Lin or Log as selected)
f	Stretched Y output
g	Ground closure to dump Stretched Y Output
t	Ground

Section IV

INSTALLATION

4.1 INTRODUCTION

This section contains information on bench operation versus rack mounting, ac power line connection, and connection of the Model CCA-7 to the NM-17/27 and NM-37/57 EMI/FI Meters.

4.2 BENCH OPERATION

The CCA-7 is shipped ready for use as a bench-operated instrument. A folding support that is attached to the feet under the front of the instrument may be pulled down to elevate the front of the instrument for ease of operation.

4.3 RACK MOUNTING

A set of adapter brackets and attaching screws are provided to permit mounting of the CCA-7 into a standard 19-inch rack. To prepare the instrument for rack mounting, proceed as follows:

a. Remove the six screws that attach the four feet and folding support to the bottom of the instrument. Retain the screws, feet, and support for future use.

b. Attach one rack mounting bracket (Part No. 3-103895-001) to each side of the instrument using two 10-32 x 3/8 screws (Part No. 1-964064-263) in each bracket.

4.4 AC POWER LINE CONNECTION

The CCA-7 requires ac power of 105 to 125 volts, or 210 to 250 volts, approximately 12 watts. For 115 V operation, use 0.5A fuse; for 230 V operation, use 0.25A fuse.

4.4.1 115 V Versus 230 V Operation

The CCA-7 is shipped ready to operate on 105 V rms to 125 V rms, 50 Hz to

400 Hz. For 210 V rms to 250 V rms operation use the following procedure:

a. Slide the transparent fuse cover on the power receptacle assembly on the back panel upward to expose the fuse. The number 120 is exposed on the printed circuit card.

b. Pull the FUSE PULL lever out and upward to release the fuse.

c. Remove the fuse.

d. With the FUSE PULL lever completely upward, remove the printed circuit card by means of the hole in the end of the card.

e. Turn the printed circuit card over to expose the number 240 and re-insert.

f. Set the FUSE PULL lever completely upward and replace the fuse with 0.25A rating for 240 V rms operation.

g. Slide the transparent fuse cover down to cover the fuse.

WARNING

Do not insert the printed circuit card reversed, so that the number 100 or 220 is exposed. In that case the primary coil of the power transformer is not connected to the power line.

4.4.2 Power Cable Installation

Connect the female end of the 7-1/2-foot ac power cable (Part No. 1-910166-001) to the power receptacle assembly on the rear panel of the instrument. Connect the male end of the cable to the ac power source.

WARNING

The CCA-7 is designed for operation from a polarized, three-terminal power receptacle having one terminal connected to earth ground. When only a two-terminal power receptacle is available, to eliminate shock hazard, use a three-prong to two-prong adapter and connect the adapter pigtail lead to the power receptacle ground.

4.5 CONNECTION TO EMI/FI METERS AND PROGRAMMER

The CCA-7 may be used connected only to the NM-17/27 and/or to the NM-37/57 EMI/FI Meters and used in the LOCAL mode of operation; or it may also be connected to the CP-7 Programmer and used in the REMOTE mode of operation. Connection procedure would be:

a. Connect one of the IF cables (Part No. 2-004834-001) to the IF OUTPUT of the NM-17/27 and to the 455 kHz IF INPUT receptacle of the CCA-7.

b. Connect the second IF cable to the IF OUTPUT of the NM-37/57 and to the 20.5 MHz IF OUTPUT of the CCA-7.

c. If only EMI/FI Meters are used, the CCA-7 CONTROL MODE switch should be in the LOCAL position. If the CP-7 Programmer is to be used, the CCA-7 CONTROL MODE switch should be in the REMOTE position.

d. Connect the Model 94595-1 Programmer cable to the CP-7 Programmer CCA-7 CISPR/ANSI ADPT receptacle and to the CCA-7 Programmer receptacle.

e. Operate the CCA-7 POWER pushbutton. The power indicating light should turn on. One of the four dB Meter scales will be illuminated.

4.6 CALIBRATION FIGURE ALIGNMENT

When the CCA-7 Adapter is connected for the first time to the NM-17/27 and NM-37/57 EMI/FI Meters, it is advisable to recheck the Cal Figure of the CCA-7 in all three frequency ranges and realign them if necessary for full scale meter deflection (FSD). Use the CALIBRATION FIGURE TEST AND ALIGNMENT procedure, Paragraph 8.15. The calibration (gain standardization) of the CCA-7, as described in Paragraph 5.3, is based on the assumption that the Cal Figure is at exactly FSD.

The CCA-7 is calibrated with the internal calibration sources (impulse calibrators) of the corresponding EMI/FI Meters. The nominal pulse repetition frequency (PRF) of the NM-17/27 is 450 Hz, and that of the NM-37/57 is 400 Hz, but the actual PRF of the individual EMI/FI Meters may vary considerable from the nominal values. The Cal Figure of the CCA-7 is factory adjusted with nominal PRF impulse calibrators in all three frequency ranges to FSD. If the PRF of the EMI/FI Meters

to which the CCA-7 will be connected deviates from the nominal value, the Cal Figure of the CCA-7 will be affected.

Section V

OPERATING INSTRUCTIONS

5.1 INTRODUCTION

Instructions for calibration and operation of the Model CCA-7, when used with the Model NM-17/27 and Model NM-37/57 EMI/FI measuring equipments, are presented in this section. Information is also presented on CISPR and ANSI signal level calculations and on the use of the CCA-7 Y OUTPUT for plotting QP signal spectrums. Refer to Section IV for information on connection of the CCA-7 to the NM-17/27 and NM-37/57 equipments and for necessary first-time calibration adjustments. Refer to Section III for descriptions of the CCA-7 operating controls, switches, indicators and receptacles.

5.2 GENERAL OPERATING INSTRUCTIONS

The CCA-7 CISPR/ANSI Adapter may be operated manually, when the CONTROL MODE switch is set to LOCAL position; all front panel controls are functional in this position. When the CONTROL MODE switch is set to REMOTE position, the CCA-7 may be controlled by a suitable programmer; e.g. AILTECH Computer Programmer Model CP-7. When in the REMOTE mode all CCA-7 front panel controls are disabled except the POWER switch and the CALIBRATE controls. Operation of the CCA-7 is now performed by applying control signals to various pins of the 41-pin PROGRAMMER receptacle. The following CCA-7 functions may be remotely selected:

Frequency Range: 10-150 kHz, 0.15-30 MHz, 30-1000 MHz

Detector Characteristics: ANSI or CISPR

10 dB Step Attenuator: -20 dB thru +50 dB

Meter Scales: LIN or LOG

Stretched Y Output: Dump

The following CCA-7 functions cannot be remotely controlled:

+5 dB/0 dB attenuator

Calibrate controls

position and operate the ATTENUATOR of the CCA-7 for an "on scale" reading of the CCA-7 dB Meter.

WARNING

To obtain the specified signal reading accuracy of the CCA-7, the NM-17/27 meter deflection must be between 0 and 60 dB for CW signals and 0 and 55 dB for Impulse signals.

NOTES

(1) Same as in Step "a" Note 1.

(2) Same as in Step "a" Note 2.

(3) When measuring pulse signals, the CCA-7 ATTENUATOR will be in the +30 dB to -20 dB positions, depending on PRF.

c. To measure the CISPR or ANSI QP value of a signal in the 30-1000 MHz frequency range, set the BANDWIDTH switch of the NM-37/57 to 1 MHz, the FUNCTION switch to PEAK 0.05 position, tune the NM-37/57 for maximum deflection of the dB Meter and operate the ATTENUATOR switch for a 30-60 dB meter deflection. Then set the FREQUENCY RANGE switch of the CCA-7 to 30-1000 MHz, the LIN/LOG switch to LIN position and operate the ATTENUATOR of the CCA-7 for an "on scale" reading of the CCA-7 dB Meter.

WARNING

To obtain the specified signal reading accuracy of the CCA-7, the NM-37/57 meter deflection must be between 30 dB and 60 dB.

NOTES

(1) Same as in Step "a" Note 1.

(2) When measuring CW signals, the CCA-7 ATTENUATOR will be in the +50 dB to -10 dB positions.

(3) When measuring pulse signals, the CCA-7 ATTENUATOR will be in the +30 dB to -10 dB positions, depending on PRF.

5.5 SIGNAL LEVEL CALCULATION USING LINEAR METER SCALES

a. To determine the CISPR or ANSI QP value of the measured signal at the input of the EMI/FI Meter, calculate the sum of the EMI/FI Meter ATTENUATOR position, the CCA-7 ATTENUATOR position, +5 dB on the CCA-7 when used, and the CCA-7 meter deflection in dB. Use the illuminated linear meter scale.

Example:

NM-17/27 ATTENUATOR position	-20 dB
CCA-7 ATTENUATOR position	+30 dB
CCA-7 +5 dB/0 dB position	0 dB
CCA-7 meter deflection	+15 dBμV
QP level	+25 dBμV

b. When an antenna or other pick-up device is used, it is then necessary to add an antenna correction factor or other correction factor to the two terminal level determined in Step "a".

c. When measuring simultaneously the Direct Peak value of a signal on the EMI/FI Meter and the CISPR or ANSI QP value on the CCA-7, the repetition rate of the measured pulse can be approximately determined from curves of Figures 5-1 thru 5-5. The curves display the ratio of peak reading on the EMI/FI Meter to QP reading on the CCA-7 in dB versus PRF in the three frequency ranges. Use the solid curve marked NOMINAL. The dashed curves marked TOLERANCE include both the measuring accuracy of EMI/FI Meter and QP detector charge and discharge time constant tolerance.

5.6 USE OF THE 40 dB LOG METER SCALES

For a signal survey, when a larger dynamic range is desirable and less accuracy is tolerated, the LIN/LOG switch should be set to the LOG position; this results in one of the 40 dB Log scales of the dB meter to be illuminated. To calculate the CISPR or ANSI QP signal level when using the LOG scales, follow the procedures described in Paragraph 5.4, but read the CCA-7 meter deflection on the illuminated LOG scale.

The LOG scales are fairly accurate in the upper 20 dB range of the meter scale. The accuracy is limited, however, in the lowest 20 dB of scale range. It is advised to use the LOG scale only for quick survey of the CISPR or ANSI QP signal levels. To measure the CISPR or ANSI QP value of a signal accurately, use the LIN meter scales.

a. In the 10-150 kHz and in the 0.15-30 MHz frequency ranges, the +20 dB to -20 dB LOG scale of the dB meter will be illuminated. The dynamic range of the CCA-7 is expanded by 20 dB below the 0 dB level of the 0 dB to +20 dB LIN meter scale.

b. In the 30-1000 MHz frequency range, the +10 dB to -30 dB LOG scale will be illuminated. The dynamic range of the CCA-7 is expanded by 30 dB below the 0 dB level of the 0 dB to +10 dB LIN meter scale.

5.7 USE OF THE Y OUTPUT FOR SIGNAL SPECTRUM PLOTTING

The Y OUTPUT on the back panel follows the LIN/LOG switch (refer to Figure 6-1). In the LIN position the Y OUTPUT has a 10 dB dynamic range when the 30-1000 MHz range is used, and a 20 dB dynamic range when the 10-150 kHz or 0.15-30 MHz range is used. In the LOG position the Y OUTPUT has approximately 40 dB dynamic range for all frequency ranges. The slope of the Y output in the LOG position is 25 mV/dB and will provide nearly linear dB scale increments when displayed on an X-Y recorder. At FSD of the dB meter, the Y output is one volt open circuit for either LIN or LOG position.

To evaluate the signal levels on the X-Y plot, the ATTENUATOR position of the EMI/FI Meter, the ATTENUATOR position of the CCA-7 and the full scale deflection value of the LOG scale in use should be considered.

Example, in the CISPR 0.15-30 MHz frequency range:

NM-17/27 ATTENUATOR position	-20 dB
CCA-7 ATTENUATOR position	+30 dB
CCA-7 0 dB/+5 dB switch position	0 dB
CCA-7 LOG scale full deflection	+20 dBμV
Y OUTPUT maximum level	+30 dBμV

Since the dynamic range of the Y OUTPUT is 40 dB, the minimum level of the Y OUTPUT in this example is then -10 dBμV.

By connecting the X terminal of an X-Y recorder to the X OUTPUT of the corresponding EMI/FI Meter and the Y terminal to the Y OUTPUT of the CCA-7, a hard copy of the CISPR or ANSI QP signal survey can be obtained. To operate

the X-Y recorder, follow the procedures described in the NM-17/27 and NM-37/57 Instruction Manuals. The pen lift of the X-Y recorder will be operated by the EMI/FI Meter.

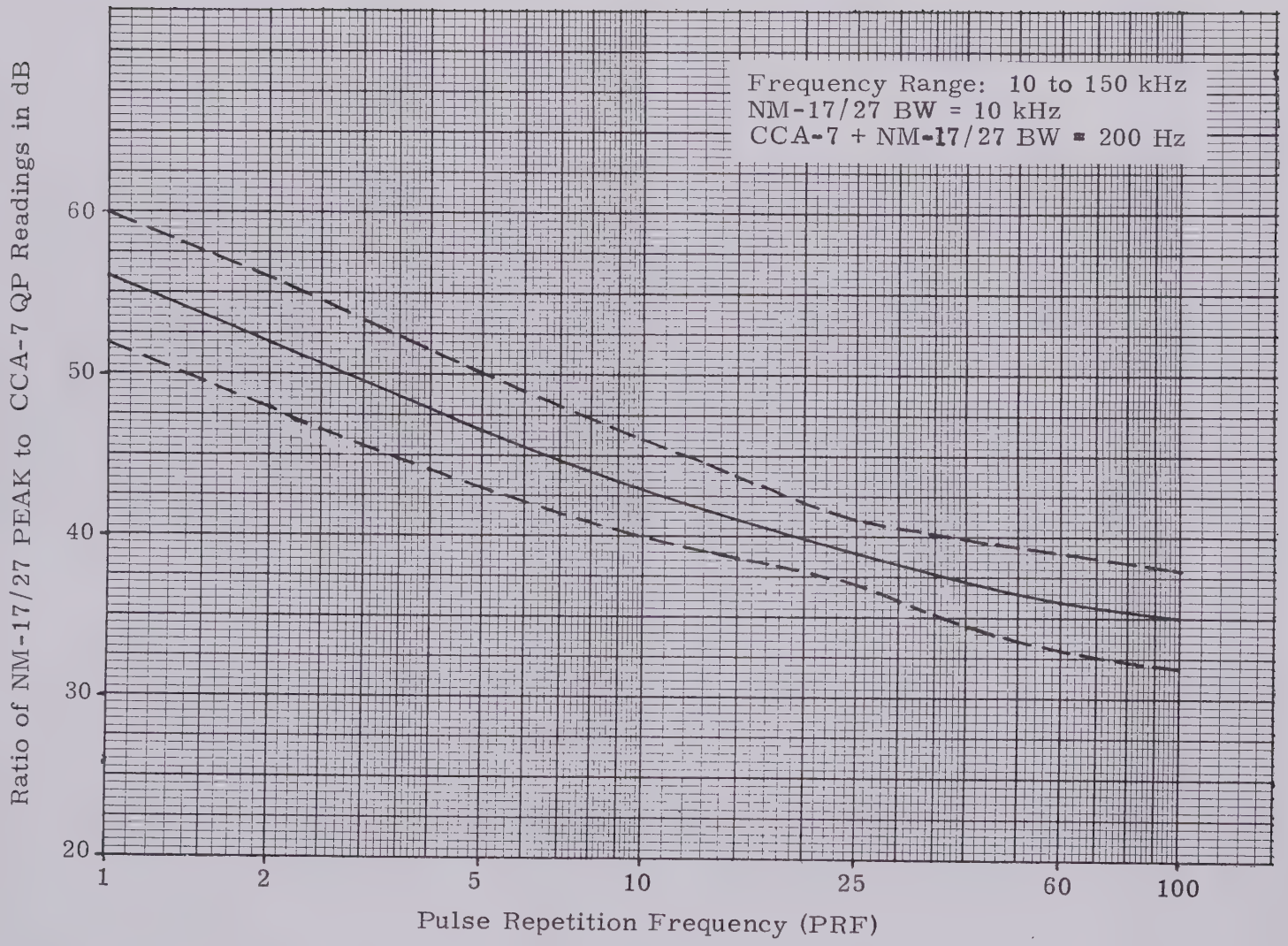


Figure 5-1. Relationship Between NM-17/27 PEAK Reading and CCA-7 (CISPR QP) Reading (10 to 150 kHz) Versus PRF.

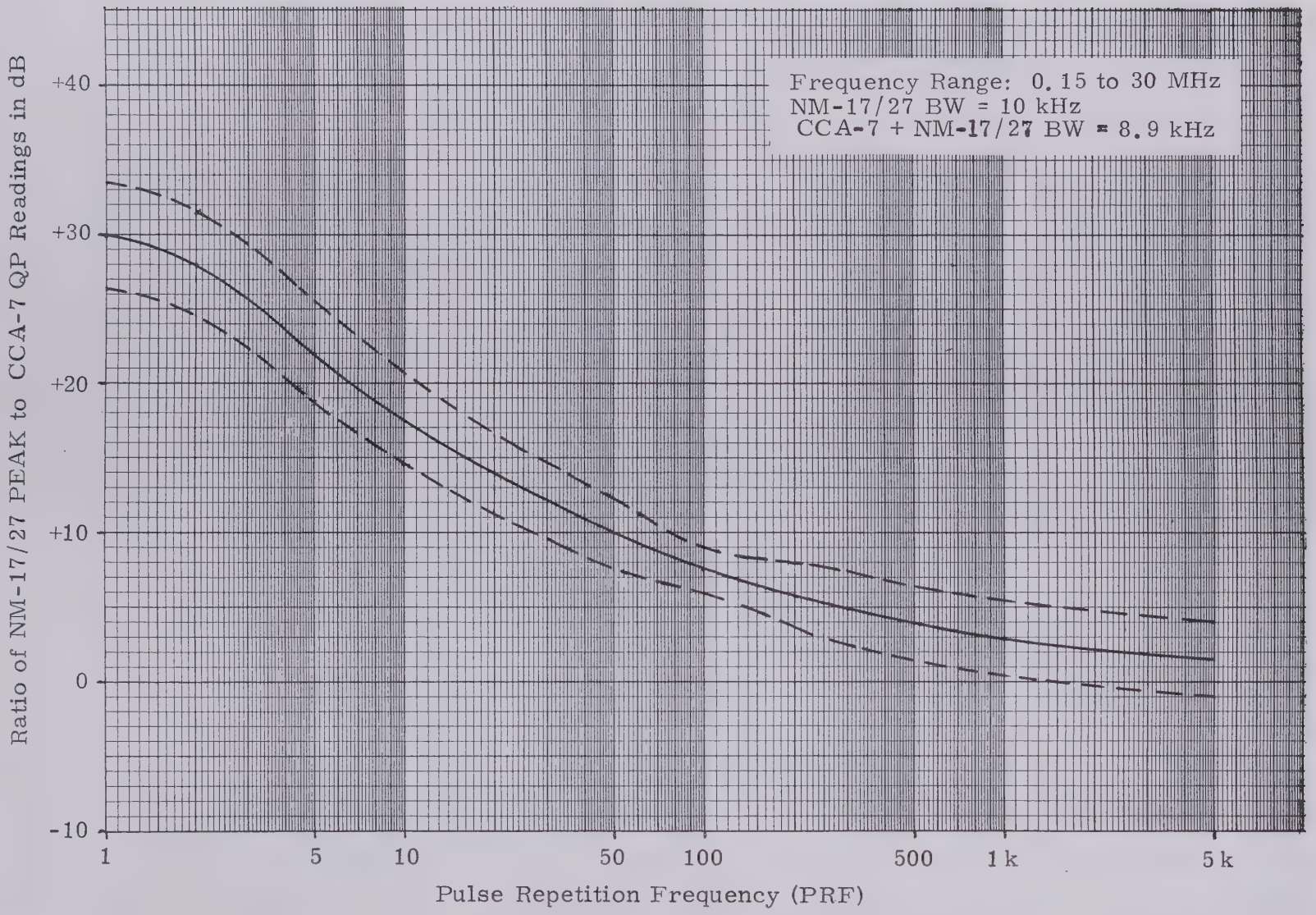


Figure 5-2. Relationship Between NM-17/27 PEAK Reading and CCA-7 (CISPR QP) Reading (0.15 to 30 MHz) Versus PRF.

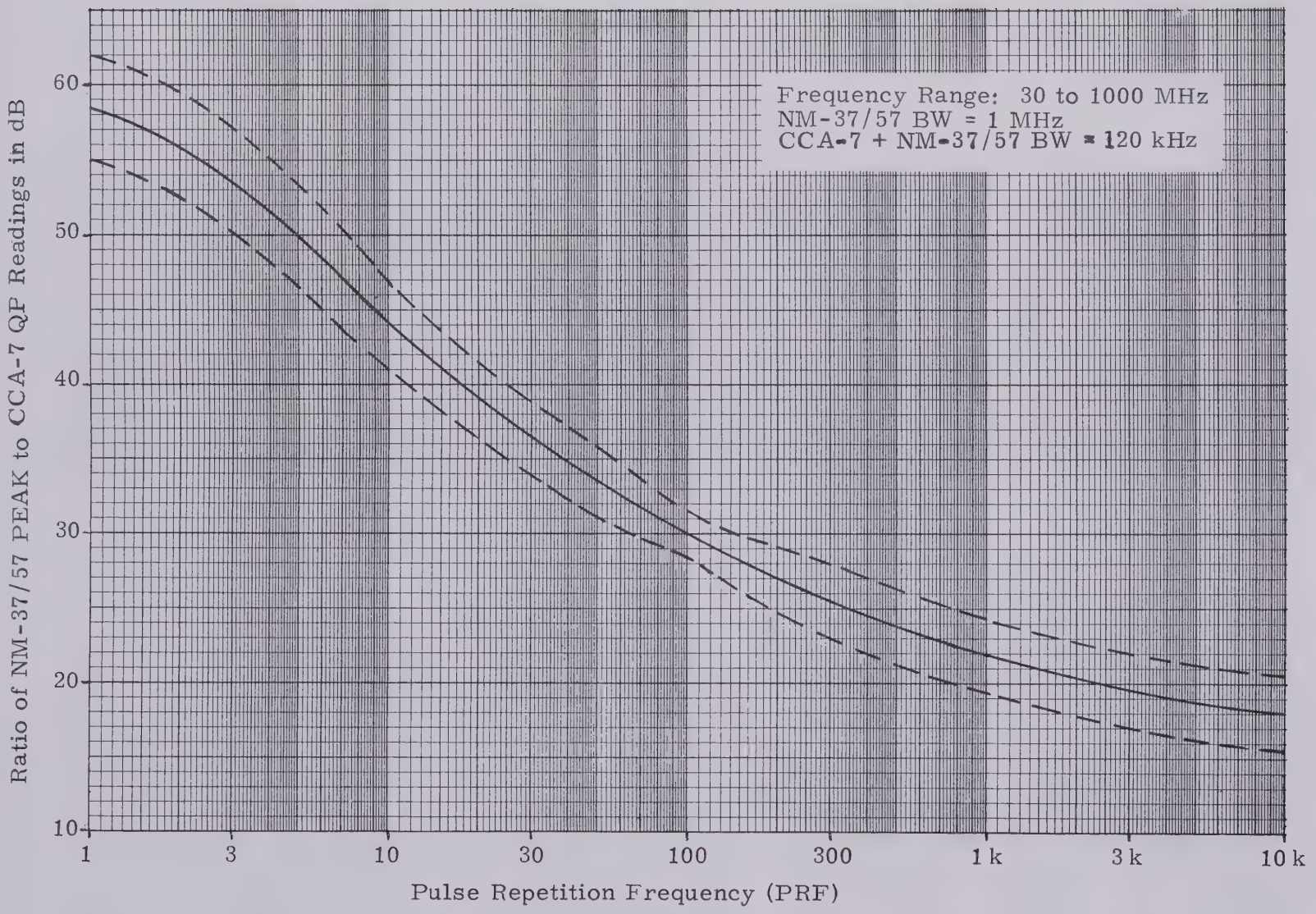


Figure 5-3. Relationship Between NM-37/57 PEAK Reading and CCA-7 (CISPR QP) Reading (30 to 1000 MHz) Versus PRF.

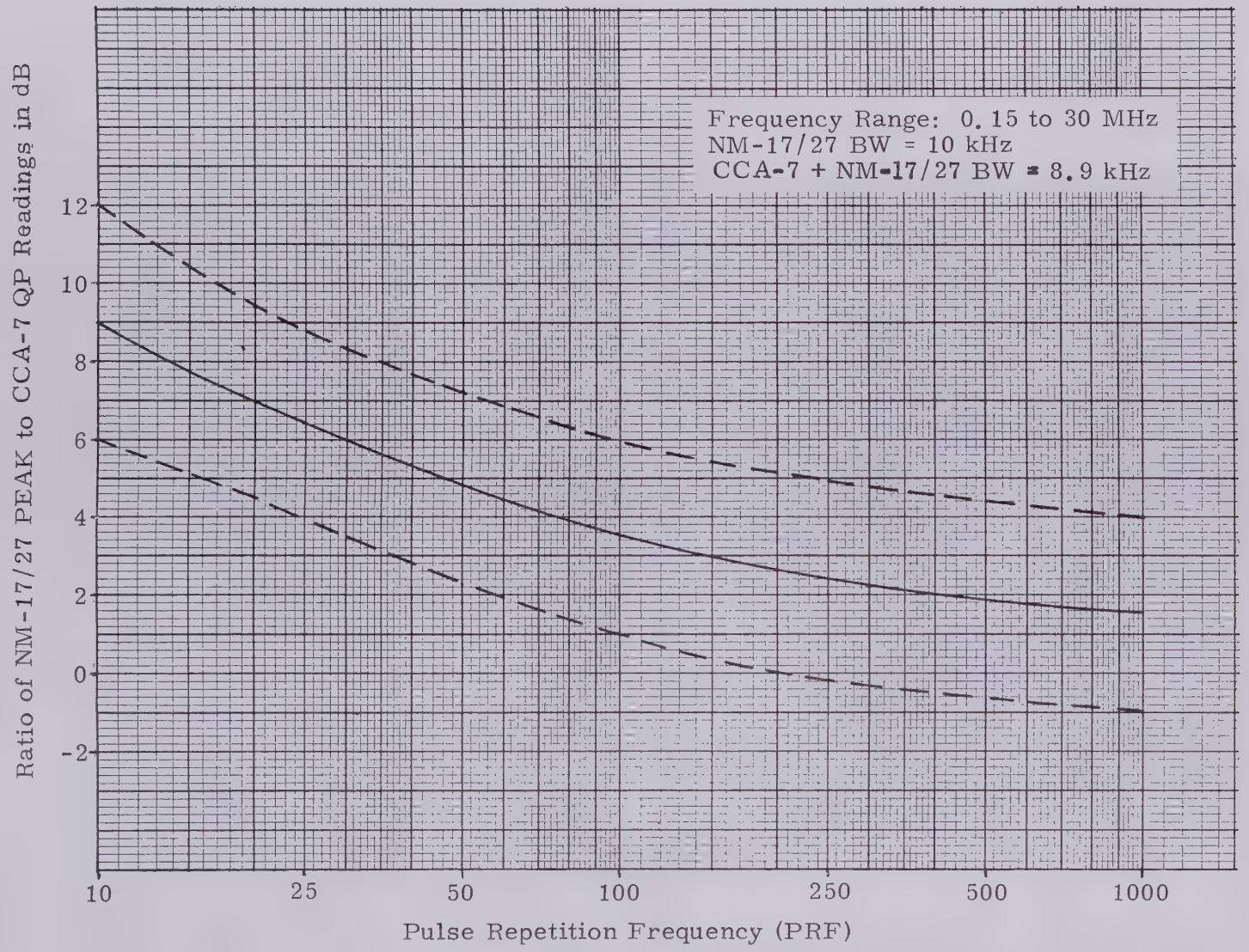


Figure 5-4. Relationship Between NM-17/27 PEAK Reading and CCA-7 (ANSI QP) Reading (0.15 to 30 MHz) Versus PRF.

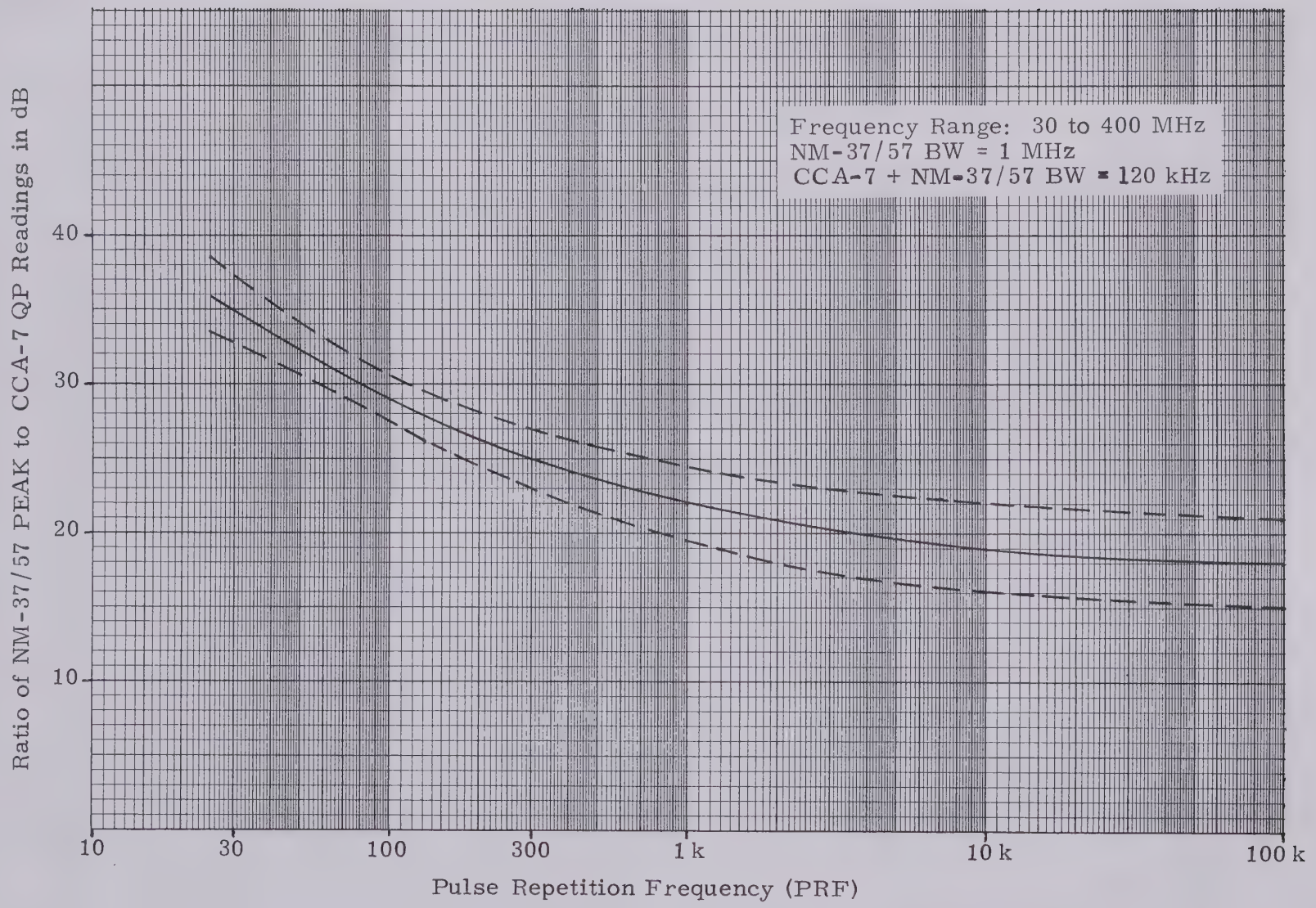


Figure 5-5. Relationship Between NM-37/57 PEAK Reading and CCA-7 (ANSI QP) Reading (30 to 400 MHz) Versus PRF.

Section VI

THEORY OF OPERATION

6.1 INTRODUCTION

This section contains the theory of operation of the programmable Model CCA-7 CISPR/ANSI Adapter. The information is presented in two parts; a basic discussion of the Simplified Block Diagram, Figure 6-1, and a detailed circuit analysis, oriented to the schematic diagrams, Figures 10-1 through 10-6. The block diagram discussion will aid the user in understanding the design principles of the CCA-7. The detailed circuit analysis is primarily for the benefit of the technician to troubleshoot and repair the adapter.

6.2 BASIC PRINCIPLES OF OPERATION

To meet the CISPR and ANSI specifications, a linear amplifier and detector should be used as described in Appendix B. Therefore, the two CCA-7 Adapter IF inputs of 455 kHz and 20.5 MHz are connected to the IF outputs of the NM-17/27 and the NM-37/57 respectively, which are taken ahead of the logarithmic IF amplifiers of the EMI/FI Meters. The NM-17/27 IF frequency is 455 kHz and the nominal IF output level at 60 dB Meter deflection is 100 mV rms. The NM-17/27 covers the 10-150 kHz and the 0.15-30 MHz frequency ranges of the CCA-7 Adapter. The NM-37/57 IF frequency is 20.5 MHz and the nominal IF output level at 60 dB Meter deflection is 25 mV rms. The frequency range of the NM-37/57 covers the 30-1000 MHz range of the CCA-7 Adapter.

When measuring the CISPR or ANSI QP level of a signal with the CCA-7 Adapter, it is important to operate the NM-17/27 and NM-37/57 equipments within their dynamic range capabilities, where dynamic range spans from internal noise at the low end to overload at the upper end. The NM-37/57 was designed so that overload will not occur at full scale Output Meter indication using the Peak

Detector function when operating at a bandwidth of 1 MHz. The NM-17/27 will reach overload in the 10 kHz bandwidth when measuring Impulse Signals and no attempt should be made to achieve an Output Meter indication of greater than 55 dB (see NM-17/27 manual, Figure 4-2). The maximum dynamic range is available when the NM-17/27 and NM-37/57 attenuators are set so that the Peak detector indication of the signal on the Output Meter is between 30 and 55 dB, well above the internal noise.

In the three frequency ranges covered by the CCA-7 CISPR/ANSI Adapter, the 6 dB bandwidth values and predetector overload factors are individually specified in Table 2-1. To meet the widely different requirements of each frequency range, the CCA-7 contains three IF amplifiers. Only one IF amplifier is operated at a time, selected by the FREQUENCY RANGE switch on the front panel of the CCA-7. The required overall bandwidths in the 10-150 kHz and in the 30-1000 MHz frequency ranges are much narrower than the bandwidth of the EMI/FI Meter in use (200 Hz< <10 kHz, 120 kHz <1 MHz); therefore, the CISPR/ANSI bandwidth is determined only by the IF amplifiers of the CCA-7. In the 0.15-30 MHz frequency range, however, the mean value of the required overall CISPR/ANSI 6 dB bandwidth of 8 to 10 kHz is close to the 10 kHz bandwidth of the NM-17/27. For practical considerations an overall 8.15 kHz bandwidth was chosen, requiring a CCA-7 IF amplifier with a 3 dB bandwidth of 11.36 kHz. Frequency range selection can be done remotely by a Programmer in the REMOTE position of the LOCAL/REMOTE switch.

In the 30-1000 MHz frequency range, to make the selectivity requirements less stringent, the 20.5 MHz input frequency is converted down to 1.6 MHz. The 20.5/1.6 MHz converter is followed by a 1.6 MHz amplifier of 120 kHz bandwidth. Each of the three IF channels is provided with a calibration (gain) control, operated on the front panel of the CCA-7. The three IF amplifiers, including their transistor input and output switches, are located on PC board A1A1. Calibration cannot be controlled remotely.

The dynamic range of the CISPR/ANSI QP detector is established by the predetector overload factor specified in the CISPR publications (24, 30 and 43.5 dB) and by the dB range displayed on the CCA-7 dB meter. To keep the dynamic range within reasonable limits, the linear meter scale for the 30-1000 MHz frequency range is 10 dB and the linear meter scale for the two other frequency ranges is 20 dB, yielding a maximum dynamic range of 54 dB. To cover the wide dynamic range, a high power wideband detector driver is applied ahead of the QP detector.

The CCA-7 detector is composed of two sections, a passive envelope detector followed by an active QP detector. The passive detector rectifies the 455 kHz or 1.6 MHz IF signal leaving only the modulation components permitted by the 120 kHz, 8.15 kHz or 200 Hz overall bandwidths ahead of the detector. The active QP detector has a very low threshold level and a bandwidth of about 100 kHz, adequate response for modulation components with maximum frequency of 60 kHz. The time constants of the detector and the gain of the active detector are controlled by the FREQUENCY RANGE switch S2, via relays K2 through K5. The detector characteristics can be controlled remotely. The detector driver and the detector circuits are located on PC board A1A2, which also contains a 5 dB IF attenuator. The latter is controlled by the 0 dB/+5 dB switch, S4, on the front panel, via relay K1.

When measuring CW signals, the CCA-7 indicates the same signal level as the corresponding EMI/FI Meter. When measuring pulse-type signals, however, the CCA-7 indicates lower than the EMI/FI Meter using a PEAK detector function, because of bandwidth losses and QP losses in the CCA-7. The bandwidth loss is the ratio of the EMI/FI Meter bandwidth to the overall CISPR/ANSI bandwidth expressed in dB, which is only 1 dB in the 0.15-30 MHz frequency range, but it is 18 dB in the 30-1000 MHz frequency range and 34 dB in the 10-150 kHz range.

The QP detector losses are determined by pulse response versus PRF curves, Figures A1 thru A5. The maximum QP losses occur at single pulses, and it amounts in the 10-150 kHz frequency range to 24 dB, in the 0.15-30 MHz range to 30 dB and in the 30-1000 MHz range to 44 dB. To obtain "on scale" readings on the CCA-7 dB meter when measuring CW signals, as well as, when measuring pulses, an IF step attenuator is inserted between the IF amplifiers and detector driver circuit. The 10 dB step ATTENUATOR switch S3 also controls the gain of the post-detector video amplifier. Basically, the IF attenuator compensates for the bandwidth losses, and the gain change of the video amplifier compensates for the QP losses in order to obtain "on scale" readings on the CCA-7 dB meter when measuring pulse-type signals.

A logarithmic video amplifier of 40 dB dynamic range follows the linear video amplifier. The linear and logaritchmic video amplifiers and the dB meter circuit (an RC network which determines the post-detector overload factor and shapes the meter time constant) are located on PC board A1A3. The dB meter is connected either to the output of the linear video amplifier or to the output of the log video amplifier, depending on the position of the LIN/LOG switch. The LIN/LOG switch S5 also turns on the two light-emitting diodes (LED's) at either end of the dB meter scale in use.

The ATTENUATOR switch (S3) has eight operating and one calibrating position. Pole S3B controls the operation of relay K1 and the four-channel FET switches U1 and U2 that insert 0, 10, 20, 30 or 40 dB T-pads in the IF signal path. Switch pole S3A controls the gain of the linear video amplifier. Table 6-1 shows the IF attenuations and video gains in the various operating positions of the ATTENUATOR switch. The eight operating positions of S3 can be controlled remotely.

Table 6-1. IF Attenuation and Video Gain

ATTENUATOR position	+50	+40	+30	+20	+10	0	-10	-20 dB
IF Attenuation	40	30	20	10	10	10	10	0 dB
Video Gain	20	20	20	20	30	40	50	50 dB

In the CAL position S3A overrides the separate 0 dB/+5 dB attenuator switch and applies +12.6 V to pole S2B of the FREQUENCY RANGE switch. The 0 dB/+5 dB switch cannot be operated remotely.

The FREQUENCY RANGE switch S2 has two poles and six positions. Pole S2A selects the proper IF channel, the detector and meter time constants and the active detector gain. Pole S2B selects the proper video gain and modifies the gain of the IF amplifiers during calibration to obtain the correct calibration figure. The FREQUENCY RANGE switch, the ATTENUATOR switch and the connections between the PC boards are on the mother board A1.

The power supply A5 provides $\pm$12.6 V at approximately 80 mA. The power connector J4 is mounted on the back panel. The POWER switch S1 and indication LED are placed on the front panel of the CCA-7. The front panel also carries the dB meter M1, the 0 dB/+5 dB switch S4 and the LIN/LOG switch S5.

6.3 DETAILED CIRCUIT ANALYSIS

6.3.1 Mother Board, A1

Refer to the schematic diagram Figure 10-1 and to the wiring diagram Figure 10-6.

The Mother Board A1 holds three plug-in boards A1A1, A1A2 and A1A3 which are connected by spring-loaded contacts A1A1J2 through A1A3J13. The Mother Board is permanently connected to components on the front panel and on the back panel of the CCA-7. Components mounted on the front panel are: 0 dB/+5 dB SP toggle switch S4, Lin/Log 4P2T toggle switch S5, control mode switch S6, dB Meter M1 with scale indicating LED's, power switch S1 and power indicating LED CR9.

Components mounted on the back panel are: 455 kHz IF Input receptacle J1, 20.5 MHz IF Input receptacle J2, Programmer Input connector J5, Y Output receptacle J3 and power cable assembly J4 with fuse and 120/240 V printed circuit card, and Programmer Input connector J5.

The Mother Board contains the following components: A 2 kilohm impedance, 10 dB step attenuator S3 with an additional section to control the gain of the linear video amplifier; a frequency range switch S2 with logic diodes to select the proper IF amplifier, detector gain and time constants during operation and calibration; logic diodes to enable REMOTE or LOCAL control, contacts connecting the power lines, signal lines and control lines to the three plug-in boards A1A1, A1A2, A1A3 and power supply A2; resistors in series with the LED's on the dB Meter and on the front panel, and a meter substituting resistor.

The 2P9T Attenuator-Cal switch S3 has 8 attenuator positions, -20 dB to +50 dB in 10 dB steps and a Cal position. The switch is mounted on the Mother Board, and is operated from the front panel by means of an extender shaft. The attenuator 2 kilohm impedance T-pads are placed between two separate four-pole solid state switches U1 and U2. The 10 dB pad is composed of R1, R2, R3; the 20 dB pad of R4, R5, R6; the 30 dB pad of R7, R8, R9; and the 40 dB pad R10, R11, R12. The IF attenuator is inserted between the IF amplifiers and the detector driver via contacts A1A1J3 and A1A2J2. Switch S3A applies +12.6 V control voltage to the linear video amplifier on board A1A3 via logic diodes CR5, CR6, CR7 and contacts A1A3/J2, J3, J4, J5.

The eight attenuator positions can be programmed remotely by means of level translators and diodes as shown in Table 6-2 when the CONTROL MODE switch is in the REMOTE position.

Table 6-2. Programmer Interface to 10 dB Step Attenuator

Attenuator Position	Enabling Level Translator	Related Directional Diodes
-20	Q13	CR39, CR40
-10	Q12	CR38, CR41
0	Q11	CR37, CR42
+10	Q10	CR36, CR43
+20	Q14	CR44, CR45
+30	Q17	CR48, CR51
+40	Q15	CR46, CR49
+50	Q16	CR47, CR50

When in CAL position, switch S3A applies +12.6 V to switch S2B and also removes this voltage from the 0 dB/+5 dB attenuator relay A1A2K1 (via CR1 thru CR4) so +5 dB cannot be enabled. No provision is made for Programmer operation of the +5 dB attenuator, and additionally, the circuit is so arranged that the LOCAL/ REMOTE switch S6G opens the normal +12.6 V path to A1A2K1 when in the REMOTE position.

The 2P6T Frequency Range switch S2 has positions of C (CISPR) and A (ANSI) in each of the three frequency ranges: C3/A3 in the 10-150 kHz range, C1/A1 in the 0.15-30 MHz range and C2/A2 in the 30-1000 MHz range. The switch is mounted on the Mother Board, and is operated from the front panel by means of an extender shaft. The C/A notation is used on the schematics. All ranges are also programmable by means of level translators Q5 thru Q9 and diodes CR30 thru CR34.

In the C3/A3 positions, S2A (or the Programmer) turns on the 455 kHz, 200 Hz bandwidth IF amplifier on board A1A1 via diodes CR8, CR9 (or CR31, CR32) and contact A1A1/J15. It applies control voltage to board A1A2 via CR10 and contacts A1A2/J5, J8, J9 to select the proper QP detector gain and time constants. It also applies control voltage to board A1A3 via contacts A1A3/J6, J9 to select the proper source impedance to the dB Meter.

In the C1/A1 positions, S2A (or the Programmer) turns on the 455 kHz, 17.7 kHz bandwidth IF amplifier on board A1A1 via diodes CR11, CR13 (or CR30, CR34) and contact A1A1/J8. It applies control voltage to board A1A2 via diodes CR12, CR14 and contacts A1A2/J6, J8, J10 to select the proper QP detector gain and time constants. It also applies control voltage to board A1A3 via contact A1A3/J8 to select the proper source impedance to the dB Meter.

In the C2/A2 positions, S2A (or the Programmer via diode CR33) turns on the 20.5/1.6 MHz IF converter and 1.6 MHz IF amplifier on board A1A1 via contact A1A1/J4. It applies control voltage to board A1A2 via diode CR15 and contact A1A2/J7 to select the proper detector time constants.

When calibrating the CCA-7 switch S2B applies control voltage to the linear video amplifier on board A1A3 via logic diodes CR16, CR17, CR19, CR20, CR22 and contacts A1A3/J3, J4, J5. It also applies control voltage to board A1A1 via diodes CR18, CR21 and contacts A1A1/J6, J7, J13, J14 in order to affect the IF gain during calibration. No provisions are made for remote control of calibration.

The Y-Output connector J3 is mounted on the back panel. Selection of Linear or Log output is made by relay K12, controlled by the LIN/LOG switch in LOCAL operation and by the Programmer via CR66 or CR69 and Q18 or Q21 in REMOTE operation. A portion of the Y-Output is applied to a stretching circuit (or hold-and-dump circuit) consisting of U4 and Q1 thru Q4. Comparator U4 causes capacitor C6 to be charged when the input is greater than the stored potential. No direct discharge path is provided for C6, therefore the capacitor maintains its charge, holding the peak potential. The capacitor charge is also applied to source follower Q3 whose output is applied to comparator U4 and is also the Stretched Y-Output to the Programmer via J5, pin f. Capacitor C6 remains charged until discharged by the dump circuit. The dump circuit consists of Q1, A2, and Q3, controlled by the Programmer via J5, pin g. Ground closure of pin g causes Q1 to conduct which

causes Q2 to conduct and discharges C6 to ground. Q4 is a matched pair of source follower Q3.

Trimpot R28 adjusts the bias to Q3 via Q4 in order to obtain zero output when the signal is dumped.

The following data outputs are available at the PROGRAMMER receptacle J5.

a. Linear Data on pin Y. At full scale meter deflection the linear data output is +1 V across 1 kilohm load. The linear data versus meter deflection are listed in Tables 8-4, 8-5 and 8-6.

b. Log Data on pin Z. At full scale meter deflection the log data output is +1 V across 1 kilohm load. The log data outputs versus meter deflection are listed in Tables 8-7 and 8-8.

c. Y Output on pin e. The Y OUTPUT is identical with the linear data output when the linear meter scale is selected (locally or remotely) and it is identical with the log data output when the log meter scale is selected (locally or remotely).

NOTE

The Y OUTPUT also appears at BNC receptacle J3 on the rear panel.

d. Stretched Y OUTPUT on pin f. This is the peak value of the Y OUTPUT that is held until dumped by a ground closure applied to pin g. The minimum load applicable to the Stretched Y output is 10 kilohm.

+12.6 V is connected from the power supply to terminal K and distributed to the plug-in boards via contacts A1A1/J2, A1A2/J3, A1A3/J10. -12.6 V is connected from the power supply to terminal J and distributed to the plug-in boards via contacts A1A1/J5, A1A2/J4, A1A3/J12.

Resistors R15 through R19 limit the current through the LED's to approximately 20 mA. The LED's on the dB Meter indicate the scale in use and are selected by the FREQUENCY RANGE switch S2 and LIN/LOG switch S5 on the front panel or by the Programmer. The LED, CR9, on the front panel indicates that the power is on.

The dB Meter substitution resistor R14 is connected to the linear video amplifier by the LIN/LOG switch S5, or by the Programmer, when S5 is in the LOG position. S5 connects the dB Meter to the Linear Output or to the Log Output of A1A3 via contacts of K10 and K11 and contacts A1A3/J11 and A1A3/J13 respectively.

6.3.2 IF Converter and IF Amplifiers, A1A1

The following circuit analysis refers to schematic diagram Figure 10-2. The IF Converter and IF Amplifier board A1A1 contains three sections:

a. 20.5/1.6 MHz converter and 1.6 MHz amplifier of 120 kHz bandwidth used in the 30-1000 MHz frequency range.

b. 455 kHz amplifier of 17.7 kHz bandwidth used in the 0.15-30 MHz frequency range.

c. 455 kHz amplifier of 200 Hz bandwidth used in the 10-150 kHz frequency range.

The circuit has two inputs: 20.5 MHz input J1 for section a., and 455 kHz input J11 for sections b. and c. One common output, J3, carries 1.6 MHz in the frequency range of 30-1000 MHz and 455 kHz in the frequency ranges of 0.15-30 MHz and 10-150 kHz. The gain of each section is adjustable by a front panel CALIBRATE control. To obtain the correct Cal Figure (full scale deflection of the dB Meter) the gain of each section is modified during calibration by means of the ATTENUATOR/CAL switch on the front panel.

In section a., the 20.5 MHz IF input signal is converted down in frequency to 1.6 MHz by means of an 18.9 MHz local oscillator (LO) and a double balanced mixer Z1. The crystal controlled LO is built with an N channel FET, Q5, and is connected via transformer T1 to the L port of Z1. The 20.5 MHz IF signal is applied to the R port and the 1.6 MHz output of the mixer is connected from the X port to a three-stage 1.6 MHz amplifier. The specified bandwidth is acheived by two critically-coupled, double-tuned circuits, composed of inductors L1, L2, L3, L4 and capacitors C4, C5, C6, C8, C9, C10, C12, C13, C14 and C15. The two double-tuned circuits are placed between amplifier stages Q1, Q2 and Q3, all three in CE configuration, which provides for a nominal 36 dB voltage gain. The gain control potentiometer R12 is at the base of Q3.

When calibrating, FET switches Q17 and Q18 are turned on. Q17 connects R88 to the base of Q3 and decreases the gain. Q18 connects R29 to the emitter of Q3 and increases the gain. The required gain to obtain the correct IF gain during calibration is internally adjusted by A29.

Section a. is turned on by transistor switch Q4, which also turns on the diode switch CR1 at the input and CR2 at the output. Q4 is activated when the Frequency Range switch is in the 30-1000 MHz positions.

The input impedance of the 20.5/1.6 MHz IF converter and the 1.6 MHz amplifier circuit is 50 ohms; the output impedance is 2 kilohms. The dynamic range is about 60 dB and the maximum output level is 3 V rms.

In section b., the 455 kHz IF signal is applied through diode CR4 to transistor Q6. The specified bandwidth is achieved by a single tuned circuit T2, C37, placed between CE amplifier stages Q6 and Q7, which provide for a nominal 20 dB voltage gain. The gain control potentiometer R45 is at the base of Q9. When calibrating in CISPR mode of operation, FET switch Q8 is turned on and the required gain is internally adjusted by R35. When calibrating in ANSI mode of operation, FET switch Q7 is turned on and the required gain is internally adjusted by R36. Section b. is turned on by transistor switch Q10, which also turns on diode switch CR4 at the input and CR7 at the output. Q10 is activated when the FREQUENCY RANGE switch is in the 0.15-30 MHz position.

The input impedance of the 455 kHz amplifier with 17.7 kHz bandwidth is 50 ohms and the output impedance is 2 kilohms. The dynamic range is about 50 dB and the maximum output level is 1 V rms.

In section c., the 455 kHz IF signal is applied through diode CR8 to transistor Q11. The specified bandwidth is achieved by the 455 kHz crystal BPF (FL1) placed between CE amplifier stages Q11 and Q15, which also provides for a

nominal 28 dB voltage gain. The gain control potentiometer R75 is at the base of Q15. When calibrating in CISPR mode of operation, FET switches Q12 and Q13 are turned on. Q13 shorts the crystal BPF and Q12 connects R62 parallel to the feedback resistor R60 of Q11. The required gain is internally adjusted by R62. When calibrating in ANSI mode of operation, FET switch Q14 shunts the crystal BPF with R68, which is adjusted internally for the required gain.

Section c. is turned on by transistor switch Q16, which also turns on diode switch CR8 at the input and CR13 at the output. Q16 is activated when the FREQUENCY RANGE switch is in the 10-150 kHz positions.

The input impedance of the 455 kHz amplifier with 200 Hz bandwidth is 50 ohms, and the output impedance is 2 kilohms. The dynamic range is about 50 dB and the maximum output level is 2.5 V rms.

6.3.3 Detector Driver and QP Detector, A1A2

The following circuit analysis refers to schematic diagram Figure 10-3. The Detector Driver and QP Detector board A1A2 contains a relay-operated 5 dB attenuator, a detector driver circuit, an envelope detector with bias circuitry and an active QP detector. The gain and time constants of the detectors are selected by the FREQUENCY RANGE switch on the front panel of the CCA-7.

The input to the A1A2 circuit is a 1.6 MHz or 455 kHz IF signal, depending on the frequency range. The output is dc when CW is measured and pulses of specified risetime and falltime when low PRF impulses are measured. The gain (loss) of the active detector is dependent on the selected frequency range and the reed relays that are used to obtain the proper gain. The gains are selected so that the maximum signal levels are below the distortion limit of the detector driver and saturation limit of the active detector, and the

minimum signal levels are above the threshold level of the detector when measuring CW signals or pulses of any repetition rate.

The charge and discharge time of the envelope detector and of the QP detector are dependent on the frequency range selected and on the type of test (CISPR or ANSI) conducted. Reed relays and FET switches are used to obtain the specified time constants. Table 6-3 shows the detector charge resistors, discharge resistors and charge capacitors used in the six positions of the FREQUENCY RANGE switch.

Table 6-3. Detector Components

		Envelope Detector		QP Detector		
Frequency Range	Type	C	R_D	C	R_{Ch}	R_D
10-150 kHz	CISPR	3300 pF	39 kΩ	3 µF	16.5 kΩ	147 kΩ
	ANSI	3300 pF	39 kΩ	3 µF	332 Ω	200 kΩ
0.15-30 MHz	CISPR	3300 pF	39 kΩ	3 µF	332 Ω	55 kΩ
	ANSI	3300 pF	39 kΩ	3 µF	332 Ω	200 kΩ
30-1000 MHz	CISPR	150 pF	39 kΩ	3 µF	372 Ω	200 kΩ
	ANSI	150 pF	39 kΩ	3 µF	372 Ω	200 kΩ

The 5 dB T pad R1, R2, R3 is inserted in the IF signal path by relay K1. The 0 dB/+5 dB toggle switch on the front panel of the CCA-7 applies +12 V to J1 and activates K1. When K1 is not activated, the IF signal is connected from Input J2 directly to the detector driver circuit.

The detector driver is a three-stage amplifier with heavy feedback, containing NPN (Q1) + PNP (Q2) + complementary NPN/PNP (Q3/Q4) stages; Q1 and Q2 in CE, Q3 and Q4 in CC configuration. Voltage gain of 20 dB is determined by R9 in the emitter leg of Q1 and feedback resistor R8. Input resistance is 2 kilohms and output resistance is approximately 50 ohms. The output is loaded with transformer T1 connected to the envelope detector. The maximum undistorted output of the detector driver is 3 V rms, providing for the required 60 dB dynamic range.

Hot carrier diode HP 2800, CR3, is used as envelope detector in conjunction with charge capacitors C11, C12 and discharge resistor R48. In the frequency range of 30-1000 MHz with 1.6 MHz IF frequency, C12 provides for the proper charge and discharge times. In the frequency range of 10 kHz-30 MHz with 455 kHz IF, C11 is parallel connected with C12 by operating FET switch Q5. The FREQUENCY RANGE switch on the front panel activates Q5 via logic diodes CR6 and CR9.

The 1.6 MHz or 455 kHz IF signal is applied to the envelope detector through 1:10 step-up transformer T1, providing for a maximum of 30 V rms and -38 V dc on the detector. To cover the 60 dB dynamic range, the envelope detector is forward biased, the bias current is provided by operational amplifier U1, which serves as a voltage follower. To compensate for temperature drift on the envlope detector, the bias voltage is developed as a voltage drop across CR4 and R21, components identical with CR3 and R48.

The active QP detector is designed around operational amplifier U2. High slew rate IC LM201A is used as inverter with feed forward compensation (C13) to provide high Gain-Bandwidth product needed to correctly detect narrow pulses. CR13 acts as QP detector, C14 as charge capacitor, R36, R37, R38 are the charge resistors and R39, R40 and R46 the discharge resistors, to obtain the specified time constants for the three frequency ranges.

The (-) output of the envelope detector is applied to the input of U2 via R26. The feedback for (+) inputs is established by CR12 and for (-) inputs by CR13, U3 and resistors R30, R31, R32. The (+) output of U2 processed by the QP detector appears at the output J11.

The gain of the active detector is determined in the 30-1000 MHz frequency range by R26 and R30, in the 0.15-30 MHz range by R26 and R32 parallel

connected to R30 and in the 10-150 kHz range by R26 and R31 parallel connected to R30. Relay K3 connects R32 in the feedback path when +12 V is applied to J6 and K2 connects R31 in the feedback path when +12.6 V is applied to J5 by the FREQUENCY RANGE switch.

The active detector gain (loss) in the 10-150 kHz frequency range is -32 dB, in the 0.15-30 MHz range -24 dB and in the 30-1000 MHz range -14 dB. The maximum output on J11 for the three frequency ranges is +1 V, +2.5 V and +7.5 V respectively and the dynamic range is 50-60 dB.

The bias current on the envelope detector CR3 applies a (-) level to the input of U2 via R26, even when no signal is applied to the input J2. To compensate for that bias an equal (+) voltage is applied to the input of U2 by R34 via R33.

For the 30-1000 MHz frequency range, R36 in series with R38 act as charge resistor and R39 as discharge resistor. This is achieved by applying +12 V to J7, which turns on relay K4. For the 0.15-30 MHz frequency range, R36 acts as charge resistor, when relay K5 is activated by +12 V applied to J8. When conducting ANSI tests in this frequency range, R39 acts as discharge resistor. When conducting CISPR tests, +12 V is applied to J10, turning on FET switch Q7, which connects R46 in parallel with R39 as discharge resistor. When conducting ANSI tests in the 10-150 kHz frequency range, R36 acts as charge resistor and R39 as discharge resistor. In this case, K5 relay is activated. When conducting CISPR tests, R36 + R37 + R38 act as charge resistors. In this case, FET switch Q6 is turned on by applying +12 V to J9, connecting R40 in parallel with R39 as discharge resistor.

6.3.4 Linear and Log Video Amplifier, A1A3

The following circuit analysis refers to the schematic diagram Figure 10-4.

The Linear and Log Video Amplifier board A1A3 contains a linear amplifier with remotely controllable gain, an RC network (dB meter circuit) to obtain the specified post-detector overload ranges and meter time constants, and a log amplifier with input buffer.

DC or pulse input signals are applied to jack J1. The circuit has two outputs, J11 is the linear and J13 the log output, that are applied to the dB Meter by the LIN/LOG switch S5 on the front panel of the CCA-7, or by the Programmer. The log output is also applied to the Y OUTPUT receptacle on the back panel.

The gain of the linear video amplifier U1, is controlled by FET switches, operated by the ATTENUATOR switch on the front panel. The gain control signals are applied to jacks J2 through J5.

The output impedance of the linear video amplifier, which affects the time constant of the dB Meter, is selected by FET switches, operated by the FREQUENCY RANGE switch on the front panel. These control signals are applied to jacks J6 through J9.

The gain of the linear video amplifier is 20 to 50 dB, controlled in 10 dB steps. It is built around FET input op amp CA3130 (U1) in NI configuration and has such a high input impedance that it does not affect the QP detector discharge time. The gain is determined by the feedback resistor R18 and by the resistors R17, R4, R8, R12, R16 connected between U1 input and ground. When the +12 V control signal is applied to J5, FET switch Q4 is turned on, shorting R16; the gain is then 20 dB. When the control signal is applied to J4, Q3 is turned on, shorting R12 and R16, resulting in a gain of 30 dB. Similarly, when the control signal is applied to J3, Q2 is operated, resulting in 40 dB gain and when the control signal is applied to J2, Q1 is operated, resulting in 50 dB gain. R19 is the zero offset adjustment of U1.

The postdetector overload range is specified for the 30-1000 MHz frequency range to be 6 dB, and for the 0.15-30 MHz range to be 12 dB. The maximum output of the linear video amplifier is approximately 10 V while a 1 V meter is used for signal level indication in dBμV. Consequently, in the 30-1000 MHz range a 4kΩ series resistor R22 is applied ahead of the meter providing for a 6 dB overload range. In the 10 kHz-30 MHz range a control signal is applied to J7, turning on FET switch Q6, which connects R24 parallel to R22, resulting in a series resistor of 1.6 kΩ that yields 12 dB overload range. In the 10-150 kHz frequency range, the QP detector charge resistor in CISPR mode is 16.5 kΩ and in ANSI mode is 250Ω. Consequently, when applying the same CW signal to the circuit in CISPR and ANSI modes of operation, the outputs of the QP detector and the outputs of the linear video amplifier are considerably different. To obtain equal CW signal indication on the dB meter for the two modes of operation, a control signal is applied to J6 in the ANSI mode turning on FET switch Q5. When Q5 is operated, it connects R21 parallel to the dB Meter. R21 is adjusted to obtain equal CW signal indication to that obtained in the CISPR mode.

To obtain correct pulse response at low repetition rate, the time constant of the dB Meter is adjusted properly by capacitors C4, C2 and C3. When the control voltage is applied to J8, FET switch Q7 connects C2 parallel to C4, and when control voltage is applied to J9, Q8 connects C3 parallel to C4. The output of the linear video amplifier U1 is connected through LIN/LOG switch S5B to the dB Meter and also to the input of the log amplifier U3 via a buffer stage U2.

A buffer stage U2 is used to avoid the loading effect of the log amplifier U3. IC μA741 is used as buffer in a voltage follower circuit. R38 is the zero offset adjustment for U2.

Hybrid log module Burr-Brown 4127JG is used as a log video amplifier. The log module contains a temperature compensated log element covering more than 60 dB dynamic range, an internal reference and an uncommitted op amp. The reference current for the log compression is determined by R42, the log transfer slope is adjusted by R44 to about 25 mV/dB. The uncommitted op amp is used as an output buffer.

The zero offset is adjusted by R39 to obtain 1 V output of the log amplifier when the output of the linear amplifier is 1V. In this way, the linear and log meter scales indicate the same signal level at full scale deflection; +20 dB in the 10-30 MHz frequency range, +10 dB in the 30-1000 MHz range. The log meter scale in the 10 kHz-30 MHz range is from +20 dB to -20 dB, in the 30-1000 MHz range from +10 dB to -30 dB.

6.3.5 Power Supply, A5

The Dual Power Supply A5 is manufactured by Xentek Inc., San Marcos, California, Model No. XM15-120VP2. Refer to schematic diagram Figure 10-5.

The ±12 V dual power supply with dual tracking is provided with over-voltage protection (OVP). It consists of a power transformer T1, two bridge rectifiers (CR1 thru CR4 and CR5 thru CR8) and two positive voltage regulator circuits, the outputs connected in series. Each voltage regulator circuit contains an IC regulator LM305AH (IC1, IC2) and two booster transistors (Q1, Q2 and Q3, Q4). The +12.6 V is adjusted by trimpot R10 and the -12.6 V by trimpot R22. It is a master-slave relationship between the two regulators, the -12.6 V regulator acts as the master.

The regulators are provided with foldback current limiting, short circuit protection and reverse voltage protection. Due to the dual tracking character-

istic, if either output shorts, the other output also collapses. The OVP circuit is connected between the +12.6 V and -12.6 V output and is adjusted by trimpot R1 to short the outputs when the voltage across it exceeds 26 V.

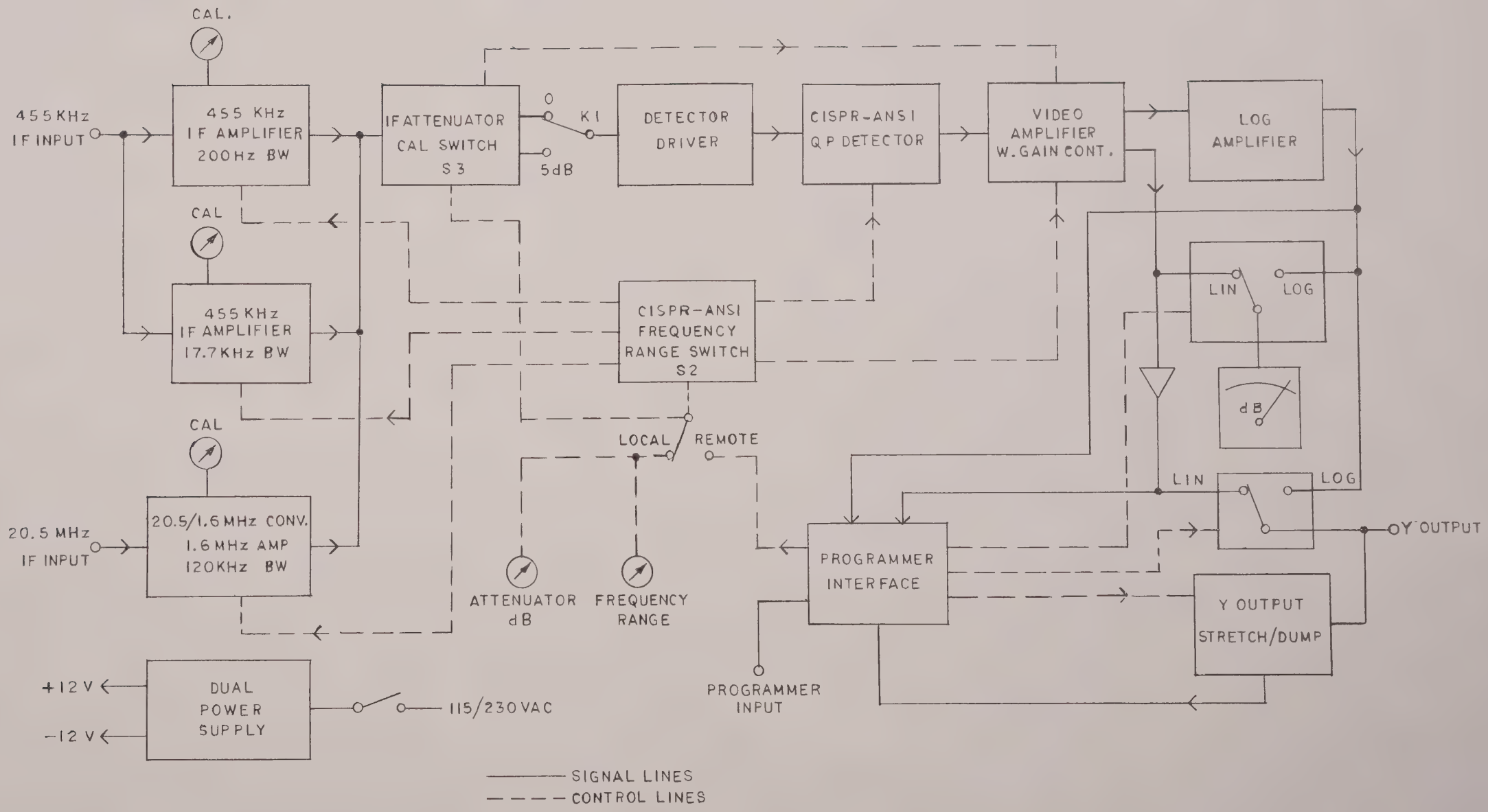


Figure 6-1. Simplified Block Diagram, Model CCA-7

Section VII

MINIMUM PERFORMANCE PROCEDURES

7.1 INTRODUCTION

This section of the manual contains Minimum Performance Procedures that may be used to verify that the Model CCA-7 CISPR/ANSI Adapter, when connected to properly working NM-17/27 and NM-37/57 EMI/FI Meters, is functioning in accordance with the specifications listed in Section II.

7.2 TEST EQUIPMENT REQUIRED FOR MINIMUM PERFORMANCE TESTS

The test equipment required for the Minimum Performance Tests is listed in Table 7-1. For each item listed, its minimum (or critical) parameters are shown, as well as recommended vendor and model number. Prior to start of testing allow equipment to warm up for a minimum period of ten minutes.

Table 7-1. Test Equipment Requirements for Minimum Performance Tests

Instrument	Minimum Parameters	Recommended Model
Signal Generator	Frequency Range: 50 kHz to 50 MHz Output Level: 1 mV to 1 V across 50 ohms	Hewlett-Packard 606A
Impulse Generator	Frequency Range: 10 kHz to 1 GHz Output Level: 10 dBμV/MHz to 80 dBμV/MHz External Trigger capability	Ailtech 533X-11
Impulse Generator	Frequency Range: 10 kHz to 35 MHz Output Level: 0 dBμV/MHz to 121 dBμV/MHz	Ailtech 93453-1
Function Generator	Frequency Range: 1 Hz to 30 kHz Output Level: 3 V p-p squarewave	Wavetek Mod. 115
Digital Voltmeter	Measurement Range: 0 to 1.2 V dc Accuracy: ±1 mV	Hewlett-Packard 3440A with 3441A plug-in
Frequency Counter	Frequency Range: dc to 50 MHz Accuracy: ±1 count ± time base accuracy	Hewlett-Packard 5326C

Table 7-1. Test Equipment Requirements for Minimum Performance Tests (cont.)

Instrument	Minimum Parameters	Recommended Model
10 dB Step Attenuator	Frequency Range: 10 kHz to 50 MHz Attenuation: 0 to 60 dB Impedance: 50 ohms	Hewlett-Packard 355D
1 dB Step Atten-	Frequency Range: 10 kHz to 50 MHz Attenuation: 0 to 10 dB Impedance: 50 ohms	Hewlett-Packard 355C
T-Adapter	BNC	Tektronix 103-0030-00

7.3 MINIMUM PERFORMANCE TEST PROCEDURES

The Minimum Performance Test Procedures do not require disassembling of the CCA-7 and access to the internal test points. The front panel dB meter and the Y Output on the rear panel are utilized to monitor the performance and the test conditions are established by operating the front panel controls. The Minimum Performance Tests are presented in three parts, according to the three frequency ranges of the Model CCA-7 Adapter. Performance tests will be done in LOCAL mode, then checked for programmable control in REMOTE mode.

A. 10-150 kHz FREQUENCY RANGE.

7.3.1 Evaluation of 6 dB Bandwidth

Connect the Signal Generator via a BNC T-adapter to the RF INPUT receptacle of the NM-17/27 EMI/FI Meter. Connect the remaining port of the T-adpater to a Frequency Counter. Set the Signal Generator for an output of 100 kHz, - 3 dBm (104 dBμV). Set the NM-17/27 CONTROL MODE switch to LOCAL, the BAND switch to 0.01-0.25 MHz, the BANDWIDTH switch to 10 kHz, AFC switch OFF, the ATTENUATOR switch to +60 dB and the FUNCTION switch to FIELD INTENSITY position. Tune the NM-17/27 for maximum dB Meter deflection. The nominal indication is 44 dB. Connect the 455 kHz IF INPUT of the CCA-7 to the IF OUTPUT of the

NM-17/27. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR or ANSI 10-150 kHz, the 0 dB/+5 dB switch to 0 dB, the LIN/LOG switch to LIN, the ATTENUATOR switch to +30 dB position, and the CONTROL MODE switch to LOCAL position.

a. Retune the NM-17/27 for maximum meter deflection on the CCA-7 (use FINE TUNE control of the NM-17/27) and adjust the 10-150 kHz CALIBRATE control of the CCA-7 for exactly 14 dB meter deflection as reference level.

b. Increase the Signal Generator output level by exactly 6 dB and tune the Signal Generator frequency above 100 kHz until the CCA-7 meter deflection returns to the reference level. Record the Frequency Counter indication as the upper 6 dB frequency.

c. Tune the Signal Generator frequency below 100 kHz until the CCA-7 meter deflection returns again to the reference level. Record the Frequency Counter indication as the lower 6 dB frequency.

d. The difference of the two frequencies recorded in Steps b and c is the 6 dB bandwidth and it is required to be within the limits specified in Table 2-1 (200 $\pm$20 Hz).

7.3.2 Evaluation of the Attenuator Accuracy

Connect the Signal Generator via a 50-ohm, 10 dB Step Attenuator to the RF INPUT of the NM-17/27. Set the CONTROL MODE switch to LOCAL position, the BAND switch to 0.01-0.25 MHz, the BANDWIDTH switch to 10 kHz, the FUNCTION switch to FIELD INTENSITY and the ATTENUATOR switch to 0 dB position. Set the Signal Generator output to 100 kHz - 47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB and tune the NM-17/27 for maximum signal indication. Adjust the CALIBRATE control of the NM-17/27 for 40 dB meter deflection. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 10-150 kHz, the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN, the CONTROL MODE switch to LOCAL position, and the 0 dB/ +5 dB switch to 0 dB position. Retune the NM-17/27 for maximum meter deflection on the CCA-7 and adjust the 10-150 kHz CALIBRATE control of the CCA-7 for exactly 19 dB meter deflection.

Then operate the 10 dB Step Attenuator and the CCA-7 ATTENUATOR switch as listed in Table 7-2 and read the meter deflection of the CCA-7. The required

value in each position is 19 ±1 dB.

Table 7-2. Step Attenuator Versus CCA-7 Attenuator Settings

Step Attenuator	0	10	20	30 dB
CCA-7 Attenuator	+40	+30	+20	+10 dB
NM-17/27 Meter Deflection	60	50	40	30 dB (for reference)
CCA-7 dB Meter Deflection	19	19	19	19 dB ±1 dB

7.3.3 Evaluation of the 20 dB Linear Meter Scale Tracking Accuracy

In the setup of Step 7.3.2, insert a 50-ohm, 1 dB Step Attenuator ahead of the NM-17/27. Set the 10 dB Step Attenuator to 10 dB and the 1 dB Step Attenuator to 0 dB. Set the CCA-7 ATTENUATOR switch to +30 dB position, operate the TUNE and FINE TUNE controls of the NM-17/27 for maximum meter deflection on the CCA-7. Adjust the 10-150 kHz CALIBRATE control of the CCA-7 for 20 dB meter deflection. Notice that the 20 dB Linear scale on the CCA-7 is illuminated.

a. Operate the 1 dB Step Attenuator from 0 to 10 dB in 1 dB steps and observe that the CCA-7 meter deflection drops by 1 dB at each step. The required accuracy is ±1.0 dB.

b. Set the 10 dB Step Attenuator to 20 dB and the 1 dB Step Attenuator to 0 dB. The CCA-7 meter should indicate 10 ±1.0 dB. Operate the 1 dB Step Attenuator from 0 to 10 dB in 2 dB steps and observe that the CCA-7 meter deflection drops by 2 dB at each step. The required accuracy is 1.5 dB.

7.3.4 Evaluation of the -20 dB to +20 dB Log Meter Scale Tracking Accuracy

In the setup of Step 7.3.3 set the 10 dB Step Attenuator to 10 dB and the 1 dB Step Attenuator to 0 dB. The CCA-7 meter indicates 20 dB. Set the LIN/LOG switch of the CCA-7 to LOG position. Notice that the -20 dB to +20 dB log meter scale becomes illuminated and that the CCA-7 meter indicates +20 dB ±0.5 dB. Readjust the 10-150 kHz CALIBRATE control for exactly +20 dB deflection, if necessary.

a. Operate the 1 dB and 10 dB Step Attenuators from 10 dB to 30 dB in 2 dB steps. Observe that the CCA-7 meter deflection drops by 2 dB at each step from +20 dB to 0 dB. The required accuracy is ±1 dB.

7.3.5 Evaluation of Y OUTPUT Accuracy

In the setup of Step 7.3.3 decrease the Signal Generator output to -57 dBm (316 μV), set the 1 dB and 10 dB Step Attenuators to 0 dB. The NM-17/27 dB meter should indicate 50 dB. Realign CALIBRATE control if necessary. With the CCA-7 ATTENUATOR switch in +30 dB position, the CCA-7 meter should indicate 20 dB (FSD). Realign the 10-150 kHz CALIBRATE control, if necessary. Connect a Digital Voltmeter (DVM) to the Y OUTPUT on the rear panel of the CCA-7. It should indicate 1000 mV ±20 mV.

a. Operate the 1 and 10 dB Step Attenuators from 0 to 20 dB as shown in the following table.

Table 7-3. Y OUTPUT Versus Step Attenuator Settings, Linear Range

Step Attenuator	0	5	10	14	20
Y OUTPUT	1000 ±20	545 ±30	296 ±20	185 ±20	88 ±15 mV
CCA-7 Meter Deflection	20	15	10	6	0

b. Operate the LIN/LOG switch from LIN to LOG position. The Y output is required to stay within ±10 mV.

c. Operate the 10 dB Step Attenuator from 0 to 40 dB in 10 dB steps and record at each step the Y output. The required values are listed in Table 7-4.

Table 7-4. Y OUTPUT Versus Step Attenuator Settings, Log Range

Step Attenuator	0	10	20	30	40 dB
Y OUTPUT	1000 ±20	764 ±30	524 ±40	276 ±50	48 ±100 mV (Log Range)
CCA-7 Meter Deflection	+20	+10	0	-10	-20 dB (for reference)

7.3.6 Evaluation of 5 dB Attenuator Accuracy

In the setup of Step 7.3.2 adjust the 10-150 kHz CALIBRATE control of the CCA-7 for exactly 20 dB meter deflection. Operate the 0 dB/+5 dB switch from 0 dB to +5 dB position and observe that the dB meter drops from 20 dB to 15 dB. The required accuracy is ±0.5 dB.

7.3.7 Evaluation of Calibration Accuracy

a. In the setup of Step 7.3.2 set the FUNCTION switch of the NM-17/27 to CALIBRATE position and adjust the CALIBRATE control for the Cal Figure of the NM-17/27 in Band 1 (nominally 30 dB). Set the ATTENUATOR switch of the CCA-7 to CAL position and adjust the 10-150 kHz CALIBRATE control for 20 dB indication on the CCA-7 meter.

b. Set the Signal Generator output to exactly -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB. The NM-17/27 dB meter should indicate 40 dB. Set the CCA-7 ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to +5 dB position. The CCA-7 meter should indicate 15 dB. The required accuracy is $\pm$0.5 dB.

c. Set the FUNCTION switch of the NM-17/27 back to CALIBRATE position, the FREQUENCY RANGE switch of the CCA-7 to ANSI 10-150 kHz position and repeat Step a.

d. Proceed as described in Step b to determine the calibration accuracy in the ANSI 10-150 kHz FREQUENCY RANGE. The required accuracy is $\pm$0.5 dB.

7.3.8 Evaluation of Impulse Signal Reading Accuracy at the Reference PRF

The reference PRF in the 10-150 kHz frequency range is 25 pps. Measuring with CISPR detector characteristics, the response to 100 μV CW signal should be equal to the response to impulses of 120 dBμV/MHz spectral intensity at the reference PRF. Measuring with ANSI detector characteristics, the response to 100 μV CW signal should be equal to the response on impulses of 115 dBμV/MHz spectral intensity at the reference PRF.

Note 1. Calculation of the equivalent spectral intensity at the reference PRF is presented in Appendix C.

Note 2. In the 10-150 kHz frequency range ANSI Publication C63.2A does not specify the relationship between CW and pulse response. The Mininum Performance requirement was experimentally determined for the CCA-7 Adapter.

a. Set the CONTROL MODE switch of the NM-17/27 to LOCAL position, the BAND switch to 0.01-0.25 MHz, the BANDWIDTH switch to 10 kHz, the ATTENUATOR switch to 0 dB and the FUNCTION switch to PEAK 0.3 position. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 10-150 kHz, the ATTENUATOR switch to 20 dB, the LIN/LOG switch to LIN and the 0 dB/ +5 dB switch to 0 dB position. Connect the Signal Generator to the RF INPUT of the NM-17/27, set the output of the Signal Generator for 100 kHz and 100 μV (40 dBμV) and tune the NM-17/27 for maximum meter deflection on the CCA-7. The dB meter of the NM-17/27 should indicate 40 dB and the meter of the CCA-7 should indicate 20 dB. Readjust the CALIBRATE control, if necessary, to obtain the correct signal indications.

b. Set the CCA-7 ATTENUATOR to the -10 position. Replace the Signal Generator as a signal source with the Model 93453-1 Impulse Generator, which covers the 10-150 kHz frequency range. Adjust the Impulse Generator to the specified PRF of 25 pps and adjust the spectral intensity S to obtain 20 dB deflection on the CCA-7 meter. The required value is S = 90 dBμV/MHz ±1.5 dB.

NOTE

The test is conducted at a level which prevents overloading of the NM-17/27. Determine the 25 pps rate using the counter at the impulse generator SYNC output.

c. Disconnect the Impulse Generator and reconnect the Signal Generator to the INPUT of the NM-17/27. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 10-150 kHz and repeat Step a.

d. Proceed as described in Step b. The required spectral intensity is 85 dBμV/MHz ±1.5 dB.

7.3.9 Evaluation of Pulse Response Versus PRF

a. In the setup of Test 7.3.8b, but using the Model 533X-11 impulse Generator and an external triggering source, set the output of the Impulse Generator to 80 dB V/MHz at 25 PRF and the ATTENUATOR switch of the CCA-7 to -20 dB position. Adjust the 10-150 kHz CALIBRATE control of the CCA-7 for 20 dB meter deflection. Then increase the PRF of the Impulse Generator from 25 to 50 and 100 and adjust S at each step for 20 dB meter deflection. Then decrease the PRF from 25 to 10, 5, 2 and 1 and again adjust S at each step for 20 dB meter deflection. Record the relative S levels versus PRF for constant indication. The required relative levels are listed in Table 7-5.

Table 7-5. Relative S Levels Versus PRF for Constant Indication (CISPR)

PRF	100	50	25	10	5	2	1
Relative Level	-4	-2.5	0	+4	+7.5	+13	+17 dB
Tolerance	±1	±1	-	±1	±1.5	±2	±2 dB

b. In the setup of Step a, set the FREQUENCY RANGE switch of the CCA-7 to ANSI 10-150 kHz and the ATTENUATOR switch to -10 dB position. Set the Impulse Generator output to 85 dBμV/MHz and adjust the 10-150 kHz CALIBRATE control for 20 dB meter deflection. Then proceed as described in Step a. The required relative levels are listed in Table 7-6.

Table 7-6. Relative S Levels Versus PRF for Constant Indication (ANSI)

PRF	100	50	25	10	5	2	1
Relative Level	-0.75	-0.5	0	+0.5	+1	+2.25	+3.5 dB
Tolerance	±0.5	±0.5	-	±0.5	±0.5	±1	±1 dB

B. 0.15-30 MHz FREQUENCY RANGE

7.3.10 Evaluation of 6 dB Bandwidth

Starting from the setup described in Paragraph 7.3.1, change the Signal Generator frequency to 1.1 MHz, the BAND switch of the NM-17/27 to 1-2 MHz, the FREQUENCY RANGE switch of the CCA-7 to CISPR or ANSI 0.15-30 MHz position and then proceed as described in Paragraph 7.3.1. The 6 dB Bandwidth is required to be within the limits specified in Table 2-1 (9 kHz $\pm$900 Hz).

7.3.11 Evaluation of the Attenuator Accuracy

Starting from the setup described in Paragraph 7.3.2, change the Signal Generator frequency to 1.1 MHz, the BAND switch of the NM-17/27 to 1-2 MHz, the FREQUENCY RANGE switch of the CCA-7 to CISPR 0.15-30 MHz and then proceed as described in Paragraph 7.3.2.

7.3.12 Evaluation of the 20 dB Linear Meter Scale Tracking Accuracy

In the setup of Paragraph 7.3.11 insert a 50-ohm, 1 dB Step Attenuator ahead of the NM-17/27 and proceed as described in Paragraph 7.3.3.

7.3.13 Evaluation of the -20 dB to +20 dB Log Meter Scale Tracking Accuracy

In the setup of Paragraph 7.3.12, set the 20 dB Step Attenuator to 20 dB and the 1 dB Step Attenuator to 0 dB. Set the Signal Generator output to 1 mV, the ATTENUATOR switch of the NM-17/27 to 0 dB so the NM-17/27 dB Meter indicates 50 dB. Set the ATTENUATOR switch of the CCA-7 to +30 dB and the CCA-7 meter should indicate +20 dB. Set the LIN/LOG switch to LOG position and readjust the 0.15-30 MHz CALIBRATE control for exactly +20 dB meter deflection. Observe that the -20 dB to +20 dB Log meter scale is illuminated and proceed as described in Paragraph 7.3.4 Steps a and b.

7.3.14 Evaluation of Y OUTPUT Accuracy

In the setup of Paragraph 7.3.11, decrease the Signal Generator output to -57

dBm (316 V), set the 10 dB Step Attenuator to 0 dB. The NM-17/27 dB meter should indicate 50 dB. Realign CALIBRATE control if necessary. With the CCA-7 ATTENUATOR switch in +30 dB position, the CCA-7 meter should indicate +20 dB. Realign the 0.15-30 MHz CALIBRATE control if necessary. Connect a Digital Voltmeter (DVM) to the Y OUTPUT on the rear panel of the CCA-7. It should indicate 1000 mV ±20 mV. Then proceed as described in Paragraph 7.3.5 Steps a and b.

7.3.15 Evaluation of 5 dB Attenuator Accuracy

In the setup of Paragraph 7.3.11, adjust the 0.15-30 MHz CALIBRATE control of the CCA-7 for exactly 20 dB meter deflection. Operate the 0 dB/+5 dB switch from 0 to +5 dB position and observe that the dB meter drops from 20 dB to 15 dB. The required accuracy is ±0.5 dB.

7.3.16 Evaluation of Calibration Accuracy

a. In the setup of Paragraph 7.3.11, set the FUNCTION switch of the NM-17/27 to CALIBRATE position and adjust the CALIBRATE control for the Cal Figure of the NM-17/27 in Band 4 (nominally 30 dB). Set the ATTENUATOR switch of the CCA-7 to CAL position and adjust the 0.15-30 MHz CALIBRATE control for 20 dB deflection of the CCA-7 meter.

b. Set the Signal Generator output to exactly -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB. The NM-17/27 dB meter should indicate 40 dB. Set the CCA-7 ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to +5 dB position. The CCA-7 meter should indicate 15 dB. The required accuracy is ±0.5 dB.

c. Set the FUNCTION switch of the NM-17/27 back to CALIBRATE position, the FREQUENCY RANGE switch of the CCA-7 to ANSI 0.15-30 MHz and repeat Step a.

d. Proceed as described in Step b to determine the calibration accuracy in the ANSI 0.15-30 MHz FREQUENCY RANGE. The required accuracy is ±0.5 dB.

7.3.17 Evaluation of Impulse Signal Reading Accuracy at the Reference PRF

The reference PRF in the 0.15-30 MHz frequency range is 100 pps. Measuring with CISPR detector characteristics, the response to a 100 μV CW signal should be

equal to the response to impulses of 87 dBμV/MHz spectral intensity at the reference PRF. Measuring with ANSI detector characteristics at f = 1 MHz, the response to a 100 μV CW signal should be equal to the response on impulses of 84 dBμV/MHz at 100 PRF.

NOTE

Calculation of the equivalent spectral intensity at the reference PRF is presented in Appendix C.

a. Set the CONTROL MODE switch of the NM-17/27 to LOCAL position, the BAND switch to 1-2 MHz, the BANDWIDTH switch to 10 kHz, the ATTENUATOR switch to 0 dB and the FUNCTION switch to PEAK 0.3 position. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 0.15-30 MHz, the ATTENUATOR switch to 20 dB, the LIN/LOG switch to LIN, the CONTROL MODE switch to LOCAL position, and the 0 dB/ +5 dB switch to 0 dB position. Connect the Signal Generator to the RF INPUT of the NM-17/27, set the output of the Signal Generator for 1.1 MHz and 100 μV and tune the NM-17/27 for maximum meter deflection on the CCA-7. The dB Meter of the NM-17/27 should indicate 40 dB and the meter of the CCA-7 should indicate 20 dB. Readjust the CALIBRATE controls, if necessary, to obtain correct signal indications.

b. Replace the Signal Generator as signal source with the Model 93453-1 Impulse Generator, which covers the 0.15-10 MHz frequency range. Adjust the Impulse Generator at the specified PRF of 100 pps and adjust the spectral intensity S to obtain 20 dB deflection on the CCA-7 meter. The required value is S = 87 dBμV/MHz ±1.5 dB.

NOTE

The test is conducted at a level which prevents overloading of the NM-17/27. Determine the 100 pps rate using the counter at the impulse generator SYNC output.

c. Disconnect the Impulse Generator and reconnect the Signal Generator to the INPUT of the NM-17/27. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 0.15-30 MHz and repeat Step a.

d. Proceed as described in Step b. The required equivalent spectral intensity is 84 dBμV/MHz ±1.5 dB.

7.3.18 Evaluation of Pulse Response versus PRF

a. In the setup of Test 7.3.17b, but using the Model 533X-11 impulse generator and an external triggering source, set the output of the impulse generator to 67 dBμV/MHz at 100 PRF and the ATTENUATOR switch

of the CCA-7 to 0 dB position. Adjust the 0.15-30 MHz CALIBRATE control of the CCA-7 for 20 dB meter deflection. Then increase PRF of the Impulse Generator sequentially from 100 to 300 and 1000 and adjust S at each step for 20 dB meter deflection. Then decrease the PRF from 100 to 50, 25, 10, 5, 2 and 1 and again adjust S at each step for 20 dB meter deflection. Record the relative S levels versus PRF for constant indication. The required relative levels are listed in Table 7-7.

Table 7-7. Relative S Levels Versus PRF for Constant Indication (CISPR)

PRF	10^3	300	100	50	25	10	5	2	1
Relative Level	-4.5	-2.5	0	+2.5	+5.5	+10	+14.5	+20.5	+22.5 dB
Tolerance	$\pm$1	$\pm$1	-	$\pm$1	$\pm$1	$\pm$1.5	$\pm$2	$\pm$2	$\pm$2 dB

b. In the setup of Step a, set the FREQUENCY RANGE switch of the CCA-7 to ANSI 0.15-30 MHz and the Impulse Generator output to 64 dBμV/MHz. Adjust the 0.15-30 MHz CALIBRATE control for 20 dB (FS) meter deflection and proceed as described in Step a. The required relative levels are listed in Table 7-8.

Table 7-8. Relative S Levels Versus PRF for Constant Indication (ANSI)

PRF	10^3	300	100	50	25	10
Relative Level	-2	-1.3	0	+1.2	+2.8	+5.6 dB
Tolerance	$\pm$0.5	$\pm$0.3	-	$\pm$0.3	$\pm$0.5	$\pm$1.2 dB

C. 30-1000 MHz FREQUENCY RANGE

7.3.19 Evaluation of 6 dB Bandwidth

Connect the Signal Generator via a BNC T-adapter to the RF INPUT receptacle of the NM-37/57 EMI/FI Meter. Connect the third port of the T-adapter to a Frequency Counter. Set the Signal Generator for an output of 40 MHz, -3 dBm (104 dBμV). Set the CONTROL MODE switch of the NM-37/57 to LOCAL position, the BAND switch to 30-57 MHz, the BANDWIDTH switch to 1 MHz, the AFC switch to OFF, the ATTENUATOR switch to +60 dB and the FUNCTION switch to FIELD INTENSITY position. Tune the NM-37/57 for maximum dB Meter deflection. The nominal indication is 44 dB. Connect the 20.5 MHz IF INPUT of the CCA-7 to the IF OUTPUT of the NM-37/57. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR or ANSI 30-1000 MHz, the 0 dB/+5 dB switch to 0 dB, the LIN/LOG switch to LIN, the CONTROL MODE switch to LOCAL position, and the ATTENUATOR switch to +40 dB position.

a. Retune the NM-37/57 for maximum meter deflection on the CCA-7 meter (use FINE TUNE control of the NM-37/57) and adjust the 30-1000 MHz CALIBRATE control of the CCA-7 for exactly 4 dB meter deflection as reference level.

b. Increase the Signal Generator output level by exactly 6 dB and tune the Signal Generator frequency above 40 MHz until the CCA-7 meter deflection returns to the reference level of 4 dB. Record the Frequency Counter indication as the upper 6 dB frequency.

c. Tune the Signal Generator frequency below 40 MHz until the CCA-7 meter deflection returns again to the reference level. Record the Frequency Counter indications as the lower 6 dB frequency.

d. The difference of the two frequencies recorded in Steps b and c is the 6 dB bandwidth and it is required to be within the limits specified in Table 2-1 (120 kHz $\pm$12 kHz).

7.3.20 Evaluation of the Attenuator Accuracy

Connect the Signal Generator via a 50-ohm, 10 dB Step Attenuator to the RF INPUT of the NM-37/57. Set the CONTROL MODE switch of the NM-37/57 to LOCAL position, the BAND switch to 30-57 MHz, the BANDWIDTH switch to 1 MHz, the FUNCTION switch to FIELD INTENSITY and the ATTENUATOR switch to 0 dB position. Set the Signal Generator output to 40 MHz, -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB and tune the NM-37/57 for maximum signal indication. Adjust the CALIBRATE control of the NM-37/57 for a 40 dB meter deflection. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 30-1000 MHz, the ATTENUATOR switch to +30 dB, the LIN/LOG switch to LIN, the CONTROL MODE switch to LOCAL position, and the 0 dB/+5 dB switch to 0 dB position. Retune the NM-37/57 for maximum meter deflection on the CCA-7 and adjust the 30-1000 MHz CALIBRATE control of the CCA-7 for exactly 9 dB meter deflection.

Then operate the 10 dB Step Attenuator and the CCA-7 ATTENUATOR switch as listed in Table 7-9 and read the meter deflection of the CCA-7. The required value in each position is 9 $\pm$1 dB.

Table 7-9. Step Attenuator Versus CCA-7 ATTENUATOR Settings

Step Attenuator	0	10	20	30 dB	
CCA-7 ATTENUATOR	+50	+40	+30	+20 dB	
NM-37/57 Meter Deflection	60	50	40	30 dB	(for reference)

7.3.21 Evaluation of 10 dB Linear Meter Scale Tracking Accuracy

In the setup of test 7.3.20, insert a 50-ohm, 1 dB Step Attenuator ahead of the NM-37/57. Set the 10 dB Step Attenuator to 10 dB and the 1 dB Step Attenuator to 0 dB. Set the CCA-7 ATTENUATOR switch to +40 dB position, operate the TUNE and FINE TUNE controls of the NM-37/57 for maximum meter deflection on the CCA-7. Adjust the 30-1000 MHz CALIBRATE control of the CCA-7 for 10 dB meter deflection on the LIN scale. Note that the 10 dB Linear scale on the CCA-7 is illuminated.

Operate the 1 dB Step Attenuator from 0 to 10 dB in 1 dB steps and observe that the CCA-7 meter deflection drops by 1 dB at each step. The required accuracy is $\pm$0.5 dB.

7.3.22 Evaluation of the -30 dB to +10 dB Log Meter Scale Tracking Accuracy

In the setup of Paragraph 7.3.21, set the 10 dB Step Attenuator to 10 dB and the 1 dB Step Attenuator to 0 dB. The NM-37/57 dB meter should indicate 50 dB and the CCA-7 meter 10 dB. Set the LIN/LOG switch of the CCA-7 to LOG position. Note that the -30 dB to +10 dB Log meter scale is illuminated and the CCA-7 meter indicates +10 dB $\pm$0.5 dB. Readjust the 30-1000 MHz CALIBRATE control for exactly +10 dB deflection if necessary.

a. Operate the 1 dB and 10 dB Step Attenuator from 10 dB to 30 dB in 2 dB steps. Observe that the CCA-7 meter deflection drops by 2 dB at each step from +10 dB to -10 dB. The required accuracy is $\pm$1 dB.

7.3.23 Evaluation of Y OUTPUT Accuracy

In the setup of Paragraph 7.3.20, decrease the Signal Generator output to -57 dBm (316 μV), set the 10 dB Step Attenuator to 0 dB. The NM-37/57 dB meter should

indicate 40 dB. Realign CALIBRATE control if necessary. When the CCA-7 ATTENUATOR switch is in 40 dB position, the CCA-7 meter should indicate 10 dB on the LIN scale. Realign 30-1000 MHz CALIBRATE control if necessary. Connect the Digital Voltmeter (DVM) to the Y OUTPUT on the rear panel of the CCA-7. It should indicate 1000 mV ±20 mV. Insert a 50-ohm, 1 dB Step Attenuator ahead of the NM-37/57.

a. Operate the 1 dB Step Attenuator from 0 to 10 dB as shown in the following table.

Table 7-10. Y OUTPUT Versus Step Attenuator Settings, Linear Range

Step Attenuator	0	2	6	10 dB
Y OUTPUT	1000 ±20	787 ±50	485 ±30	296 ±20 mV
CCA-7 Meter Deflection	+10	8	4	0 dB (for reference)

b. Operate the LIN/LOG switch from LIN to LOG position. The Y OUTPUT is required to stay within ±10 mV.

c. Operate the 10 dB Step Attenuator from 0 to 40 dB in 10 dB steps and record at each step the Y OUTPUT. The required values are listed in Table 7-11.

Table 7-11. Y OUTPUT Versus Step Attenuator Settings, Log Range

Step Attenuator	0	10	20	30	40 dB
Y OUTPUT	1000 ±20	764 ±30	514 ±40	242 ±50	0 ±100 mV
CCA-7 Meter Deflection	+10	0	-10	-20	-30 dB (for reference)

7.3.24 Evaluation of 5 dB Attenuator Accuracy

In the setup of Paragraph 7.3.20, adjust the 30-1000 MHz CALIBRATE control of the CCA-7 for exactly 10 dB meter deflection (FSD). Operate the 0 dB/+5 dB switch from 0 to +5 dB position and observe that the dB meter drops from 10 dB to 5 dB. The required accuracy is ±0.5 dB.

7.3.25 Evaluation of Calibration Accuracy

a. In the setup of Paragraph 7.3.20, set the FUNCTION switch of the NM-37/57 to CALIBRATE position and adjust the CALIBRATE control for the Cal Figure of the NM-37/57 at 40 MHz (nominally 30 dB).

Set the ATTENUATOR switch of the CCA-7 to CAL position and adjust the 30-1000 MHz CALIBRATE control for 10 dB deflection on the CCA-7 meter LIN scale.

b. Set the Signal Generator output to exactly -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB. The NM-37/57 dB meter should indicate 40 dB. Set the CCA-7 ATTENUATOR SWITCH to +30 dB and the 0 dB/+5 dB switch to +5 dB position. The CCA-7 meter should indicate 5 dB. The required accuracy is $\pm$0.5 dB.

c. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 30-1000 MHz and repeat Steps a and b.

NOTE

The 0 dB/+5 dB ATTENUATOR switch is not programmable.

7.3.26 Evaluation of Impulse Signal Reading Accuracy at the Reference PRF

The reference PRF in the 30-1000 MHz frequency range is 100 pps. Measuring either with CISPR or with ANSI detector characteristics, the response to a 100 µV CW signal should be equal to the response to impulses of 50 dBµV/MHz spectral intensity at the reference PRF.

Note: Calculation of the equivalent spectral intensity at the reference PRF is presented in Appendix C.

a. Set the CONTROL MODE switch of the NM-37/57 to LOCAL position, the BAND switch to 30-57 MHz, the BANDWIDTH switch to 1 MHz, the ATTENUATOR switch to 0 dB and the FUNCTION switch to PEAK 0.3 position. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 30-1000 MHz, the ATTENUATOR switch to 30 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the Signal Generator to the RF INPUT of the NM-37/57. Set the output of the Signal Generator for 40 MHz, 100 µV and tune the NM-37/57 for maximum meter deflection on the CCA-7. The dB meter of the NM-37/57 should indicate 40 dB and the CCA-7 meter 10 dB. Readjust the CALIBRATE controls, if necessary, to obtain correct signal indications.

b. Replace the Signal Generator as signal source by the Impulse Generator with external trigger, which covers the 30-1000 MHz frequency range. Set the CCA-7 ATTENUATOR to the 10 dB position. Use a Function Generator for external triggering of the Impulse Generator at the specified PRF of 100 pps and adjust the spectral intensity S to obtain 10 dB deflection on the CCA-7 meter. The required value is 50 dBµV/MHz $\pm$1.5 dB.

NOTE

The test is conducted at a signal level which prevents overloading of the NM-37/57. Determine the 100 pps rate using the frequency counter at the impulse generator SYNC output.

c. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 30-1000 MHz and repeat Steps a and b.

7.3.27 Evaluation of Pulse Response Versus PRF

a. In the setup of Paragraph 7.3.26b, but using the Model 533X-11 impulse generator and an external triggering source, set the output of the Signal Generator to 31 dBμV/MHz at 100 PRF and the ATTENUATOR switch of the CCA-7 to -10 dB position. Adjust the 30-1000 MHz CALIBRATE control of the CCA-7 for 10 dB meter deflection. Then increase PRF of the Impulse Generator sequentially from 100 to 300, 10^3, and 3×10^3 and adjust S at each step for 10 dB meter deflection. Then decrease the PRF from 100 to 50, 25, 10, 5, 2 and 1 and again adjust S at each step for 10 dB meter deflection. Record the relative S levels versus PRF for constant indication. The required relative levels are listed in Table 7-12.

Table 7-12. Relative S Levels Versus PRF for Constant Indication (CISPR)

PRF	10^3	300	100	50	25	10	5	2	1
Relative Level	-8	-4.5	0	+3.5	+8	+14	+20	+26	+28.5 dB
Tolerance	±1	±1	-	±1	±1.5	±1.5	±1.5	±2	±2 dB

b. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 30-1000 MHz position and repeat Step a. The required relative levels versus PRF are listed in Table 7-13.

Table 7-13. Relative S Levels Versus PRF for Constant Indication (ANSI)

PRF	$3x10^4$	10^4	$3x10^3$	10^3	300	100	50	25
Relative Level	-10.7	-10.3	-9	-7.5	-4.5	0	+3.5	+7 dB
Tolerance	±1.5	±1.2	±1	±1	±0.5	-	±0.5	±1 dB

7.3.28 Programmable Control

The preceding paragraphs have tested the electrical performance of the CCA-7 in the LOCAL mode of operation. The electrical performance should remain the same in the REMOTE mode of operation providing the programming circuits call up the functions correctly. The following information can be used to check for correct remote operation.

NOTE

If the CCA-7 is not to be programmed, this test is unnecessary.

Refer to Table 3-2, Programmer receptacle pin data, J5. Each pin listed (except pins "N", "Y", "Z", "e", "f" and "t") will perform the associated function within the CCA-7 when that pin is grounded while the CCA-7 CONTROL MODE switch is in the REMOTE position. Observe that the correct function is performed when each pin is grounded.

Section VIII

MAINTENANCE

8.1 INTRODUCTION

This section of the Manual contains disassembly procedures, alignment and test procedures.

Disassembly procedures are presented as necessary for ordinary maintenance requirements. Disassembly of the Model CCA-7 beyond the extent provided in this section is not recommended.

It is recommended that maintenance, particularly realignment, not be performed on a routine basis. Need for maintenance would be indicated by failure to meet limits provided in the minimum performance procedures, Section VII, tests that should be performed on a routine basis to verify satisfactory operation.

The alignment and test procedures are intended for use only by skilled personnel, well-qualified and experienced in the calibration and maintenance of laboratory test equipment. Alignment of the Model CCA-7 should not be attempted unless proper test equipment is available and unless the instructions given in this manual are clearly understood and realignment is definitely required.

The maintenance procedures described in Paragraphs 8.4 through 8.6 are conducted without connecting the CCA-7 to any signal source. The procedures of Paragraphs 8.7 through 8.14 and 8.16 are accomplished by applying IF signals from a Signal Generator to the IF INPUT's of the CCA-7. Procedure 8.15 is done by connecting the CCA-7 to the IF Output of the corresponding EMI/FI Meter and applying an RF signal to the Input of the EMI/FI Meters.

8.2 DISASSEMBLY PROCEDURES

Removal of the four cover panels from the Model CCA-7 provides access to the

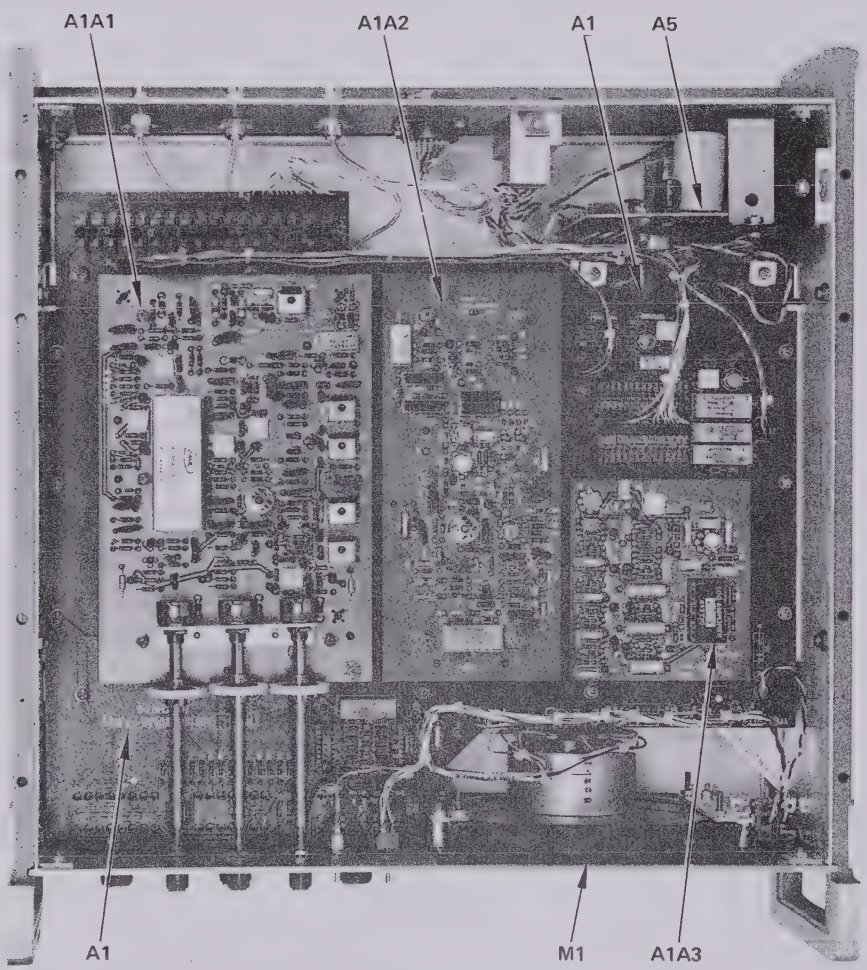


Figure 8-1. Location of Main Assemblies, Model CCA-7 Top View

subassemblies (PC boards) for alignment and maintenance. Refer to Figure 8-1 for the identification and location of the subassemblies.

To disassemble the Model CCA-7, remove the six 4-40 x 3/8 flat-head screws that secure each side cover panel. Remove the side cover panels, exposing the side frames. The socket head cap screws holding the top and bottom cover panels are now accessible. Remove the sixteen 10-32 x 3/4 socket head cap screws that secure the top and bottom cover panels to the side frames. Remove the top and bottom cover panels.

The three plug-in boards A1A1, A1A2, and A1A3 are held to the mother board by captive jack screws and connections are made by spring-loaded contacts. To test and align the Model CCA-7 it is not necessary to remove the plug-in boards because all test points are located on the component side of the boards and are accessible from the top of the equipment. Only when a defective component or a complete board requires replacement will the removal of a plug-in board be necessary.

CAUTION

All captive jack screws should be removed or tightened sequentially one or two turns at a time to prevent PC board damage.

To remove PC board A1A3, loosen the four captive screws which secure the plug-in board to the motherboard and lift the board vertically. To remove PC board A1A2, six captive screws must be loosened. To remove PC board A1A1, three extension shafts of the CALIBRATE control potentiometers should be pulled forward, after loosening the flexible coupling set screws. Then loosen the six captive screws which secure the plug-in board to the motherboard and lift the board vertically.

8.3 TEST EQUIPMENT REQUIRED FOR TEST AND ALIGNMENT

The test equipment required for test and alignment are listed in Table 8-1, which also contains the recommended models and minimum parameters.

Table 8-1. Test Equipment Required for Maintenance Test and Alignment

Instrument	Minimum Parameters	Recommended Model
Signal Generator	Frequency Range: 50 kHz-50 MHz Output Level: 1-100 mV	Hewlett-Packard 606A
Pulse Generator with External Trigger	Pulse Amplitude: 1-10 V Pulse Width: 1-5 msec	Datapulse 110
Function Generator with Manual Trigger	Frequency Range: 0.1 Hz to 1 MHz Output Level: 3 V p-p squarewave	Wavetek 115
RF Voltmeter	Frequency Range: 1-50 MHz Measurement Range 10 mV-1 V	Hewlett-Packard 411A
AC Voltmeter with High Z Probe	Frequency Range: 1 kHz-2 MHz Measurement Range: 10 mV-1 V	Ballantine 314A
Digital Voltmeter	Measurement Range: 0 to 100 V	H-P 3440A with 3441A Plug-In
Clip-on mA Meter	Measurement Range: 1 to 100 mA	H-P 428B
Frequency Counter	Frequency Range: 10 kHz-50 MHz Accuracy: $\pm$10 Hz	H-P 5326C
Oscilloscope with Probe	Frequency Range: 50 MHz Voltage Range: 100 mV to 5 V	Tektronix 547
10 dB Step Attenuator 50 ohm	Frequency Range: 10 kHz-50 MHz Attenuation: 0 to 60 dB	H-P 355D
1 dB Step Attenuator 50 ohm	Frequency Range: 10 kHz-50 MHz Attenuation: 0 to 10 dB	H-P 355C
Balanced Mixer	Frequency Range: 0.1-50 MHz	H-P 10514A
T-Adapter	BNC	Tektronix 103-0030-00

8.4 ALIGNMENT AND TEST OF THE POWER SUPPLY (See Figures 8-6, 10-1 and 10-6)

Perform the following tests with the CCA-7 CONTROL MODE switch in the LOCAL position. Remote tests can be performed after local operation is assured.

8.4.1 Power Supply Output Test and Alignment

Check the contact plate setting of the power connector J4 on the rear panel. It should correspond to the nominal ac power line voltage. Operate the POWER pushbutton on the front panel; the power indicating light should turn on. One of the four dB meter scales should be illuminated.

a. Measure the voltage output of the power supply at terminal J of the motherboard, A1, with a digital voltmeter. It should be -12.6 V ±10 mV. Realign trimpot R22 of the power supply A5 if necessary to obtain the correct voltage (see Figure 8-6).

NOTE

If the (-) 12.6 V cannot be adjusted because the overvoltage protection circuit shorts to ground before reaching (-) 12.6 V, proceed to Paragraph 8.4.2.

b. Measure the voltage output of the power supply at terminal K of board A1. It should be 12.6 V ±10 mV. Due to the master-slave relationship between the two regulators contained in the power supply, with the (-) regulator the master, it is not required to realign trimpot R10 of the (+) regulator (it is sealed). Only if the voltage value of the two regulators deviates more than specified, should trimpot R10 be realigned (breaking the seal). Alignment of R10 has no effect on the (-) regulated voltage.

8.4.2 Overvoltage Protection Alignment

The overvoltage protection (OVP) circuit is aligned at the factory to "fire" when the ±12.6 V regulated outputs of the power supply rise above ±13.6 V. In this case, the OVP circuit shorts both outputs to ground. When the ±12.6 V outputs measured in Paragraph 8.4.1 are correct, no testing or alignment of the OVP circuit is required. If the ±12.6 V cannot be reached at terminals K and J of board A1, because the OVP circuit has "fired" below the nominal output level, then it becomes necessary to readjust the OVP circuit. In this case, turn off the Power switch, set trimpot R1 on the OVP board fully cw (see Figure 8-6) and turn the Power switch on again. The ±12.6 V regulated outputs should now appear at terminals K and J.

Connect the DVM to terminal J and slowly turn trimpot R22 cw to raise the output to -13.6 V. Then rotate trimpot R1 of the OVP circuit slowly ccw until the OVP fires, shorting the output to ground. Turn off the Power switch and turn R22 ccw by two or three turns. Turn the Power switch on again and slowly turn R22 cw to obtain the specified output of -12.6 V ±10 mV.

8.4.3 Power Distribution Test

Check the presence of +12.6 V on Jacks A1A1/J2, A1A2/J3 and A1A3/J10. Check the presence of -12.6 V on Jacks A1A1/J5, A1A2/J4 and A1A3/J12.

8.4.4 Meter Scale Light Test

Operate the FREQUENCY RANGE switch and the LIN/LOG switch on the front panel; the meter scale lights should turn on accordingly. Table 8-2 shows the scale in operation versus the switch positions.

Table 8-2. Meter Scales in Operation

Frequency Range	10-150 kHz	0.15-30 MHz	30-1000 MHz
LIN:	0 to 20 dB	0 to 20 dB	0 to 10 dB
LOG:	-20 to +20 dB	-20 to +20 dB	-30 to +10 dB

8.4.5 Current Consumption Test

a. Set the 0 dB/+5 dB switch to 0 dB position. Apply "clip-on" mA meter over the red wire connected to terminal K of the motherboard, A1. Set the FREQUENCY RANGE switch sequentially to all six positions; the mA meter should indicate a current consumption of 60-70 mA. Set the 0 dB/+5 dB switch to +5 dB position; the current drain will increase by about 15 mA.

b. Apply the "clip-on" mA meter over the white wire connected to terminal J of A1. Set the FREQUENCY RANGE switch sequentially in all six positions. the mA meter should indicate a current consumption of 50-60 mA.

8.5 SWITCHING CIRCUIT TESTS (see Figure 10-1)

Perform the following tests with the CCA-7 CONTROL MODE switch in LOCAL position.

8.5.1 FREQUENCY RANGE Switch Test

a. Set the ATTENUATOR switch to any position but CAL and the FREQUENCY RANGE switch sequentially to:

Positions →	C3	A3	C1	A1	C2	A2
Measure ≈+12.6 V at:	A1A1/J15	A1A1/J15	A1A1/J8	A1A1/J8	A1A1/J4	A1A1/J4
	A1A2/J2	A1A2/J2	A1A2/J6	A1A2/J6	A1A2/J7	A1A2/J7
	A1A2/J9	A1A2/J8	A1A2/J8	A1A2/J8	A1/X	A1/X
	A1A3/J9	A1A3/J6	A1A2/J10	A1A3/J8		
		A1A3/J9	A1A3/J8			

b. Set the ATTENUATOR switch to CAL position and set the FREQUENCY RANGE switch sequentially to:

Positions →	C3	A3	C1	A1	C2	A2
Measure ≈+12.6 V at:	A1A1/J13	A1A1/J14	A1A1/J7	A1A1/J6	A1A3/J5	A1A3/J5
	A1A3/J3	A1A3/J3	A1A3/J4	A1A3/J4		

8.5.2 ATTENUATOR Switch Test

Set the ATTENUATOR switch sequentially to:

Positions →	-20	-10	0	+10	+20	+30	+40	+50 dB
Measure ≈+12.6 V at:	A1A3/J2	A1A3/J2	A1A3/J3	A1A3/J4	A1A3/J5	A1A3/J5	A1A3/J5	A1A3/J5

8.5.3 0 dB/+5 dB Switch Test

a. Set the 0 dB/+5 dB switch to the +5 dB position and operate the ATTENUATOR switch sequentially from -20 dB to +50 dB position. Measure at each step approximately +12.6 V on jack A1A2/J1.

b. Set the ATTENUATOR switch to CAL position; the control voltage on A1A2/J1 should drop to 0 V.

8.6 BIAS AND OFFSET TESTS AND ALIGNMENTS (See Figures 8-4, 8-5, 10-3 and 10-4)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in LOCAL position.

8.6.1 Envelope Detector Bias Compensation

a. Measure the envelope detector bias voltage on the anode of CR3 on board A1A2. The nominal value is -120 mV, tolerance ±10 mV.

b. Adjust the bias compensation on the tap of trimpot A1A2/R34 to the same level but opposite polarity as measured in Step a.

8.6.2 QP Detector Offset Alignment

a. Set the FREQUENCY RANGE switch to C2 position and check the offset voltage on TP2; it should be >0 mV, but <100 mV, and the offset on TP4 should be >0 mV and <+3 mV. Adjust trimpot R29 if necessary to obtain the correct offset levels on both test points.

b. Set the FREQUENCY RANGE switch to C1 position and repeat Step a.

c. Set the FREQUENCY RANGE switch to C3 and repeat Step a.

d. After the final adjustment in Step c. recheck the offset levels on TP2 and TP4 in all six positions of the FREQUENCY RANGE switch.

8.6.3 Linear Video Amplifier Offset Alignment

a. Set the ATTENUATOR switch to +20 dB position, short test point A1A2/TP4 to ground and measure the zero offset of the linear video amplifier A1A3/U1 on A1A3/TP1. It should be between 0 and +1 mV. Realign trimpot A1A3/R19 if necessary.

b. Remove the ground from A1A2/TP4 and operate the ATTENUATOR switch from +20 dB position sequentially to +10 dB, 0 dB, -10 dB and -20 dB positions. Measure the linear video amplifier zero offset on A1A3/TP1 in each position. It should be between 0 and +20 mV. Realign trimpot A1A3/R19 if necessary, to obtain the required offset value.

8.6.4 Buffer Stage Offset Alignment

a. Set the ATTENUATOR switch to +10 dB position and check the zero offset applied to the NI input of A1A3/U2 at A1/TP2 on the motherboard in all positions of the FREQUENCY RANGE switch. It should be between 0 and +4 mV.

b. Short A1/TP2 to ground and measure the zero offset of the buffer amplifier A1A3/U2 at A1A3/TP2. It should be 0 mV. Realign trimpot A1A3/R38 if necessary.

c. Remove the ground from A1/TP2 and measure the offset at A1A3/TP2 in all positions of the FREQUENCY RANGE switch. It should be between 0 and +4 mV.

8.7 TEST AND ALIGNMENT OF THE 20.5/1.6 MHz IF CONVERTER AND 1.6 MHz IF AMPLIFIER (See Figures 8-3 and 10-2)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in LOCAL position.

8.7.1 Local Oscillator Test

a. Set the FREQUENCY RANGE switch to 30-1000 MHz position (C2 or A2) and connect an RF Voltmeter and an oscilloscope to A1A1/TP1 (L port

of the balanced mixer Z1). Measure the LO output at A1A1/TP1. It should be 300 mV rms ±10% and have an undistorted sinewave. Tune transformer T1 for maximum LO output.

b. Connect a Frequency Counter to A1A1/TP1. The nominal LO frequency is 18.9 MHz, tolerance ±500 Hz.

8.7.2 IF Converter Test

Connect the Signal Generator to the 20.5 MHz IF INPUT receptacle of the CCA-7 and set the Signal Generator output for 20.5 MHz and 10 mV. Set the ATTENUATOR switch to +40 dB, the LIN/LOG switch to LIN position and the 0 dB/+5 dB switch to 0 dB position. Connect an AC Voltmeter to A1A1/TP2 and measure the 1.6 MHz output of the balanced mixer. The nominal level is 5 mV, tolerance ±1 mV.

8.7.3 Bandpass Filter Alignment

Using setup of Paragraph 8.7.2, connect the AC Voltmeter to A1A1/TP3, set 30-1000 MHz CALIBRATE control A1A1/R12 to mid-position and tune sequentially inductors L1, L2, L3 and L4 for maximum output at A1A1/TP3.

8.7.4 IF Gain Alignment

Using setup of Paragraph 8.7.3, adjust the 30-1000 MHz CALIBRATE control A1A1/R12 for an output of 630 mV on A1A1/TP3 (G_V = 36 dB). Check the reserve gain. It should be approximately 5 dB. Check the gain control range. It should be approximately 10 dB. Return to the nominal gain of 36 dB.

8.7.5 Dynamic Range Test

a. Using setup of Paragraph 8.7.4, short A1/TP1 on the Mother Board to ground and increase the Signal Generator output until the distortion limit is reached at A1A1/TP3. The maximum undistorted output should be about 3 V rms.

b. Insert a 50-ohm, 10 dB Step Attenuator between the Signal Generator and the IF INPUT of the CCA-7. Operate the Step Attenuator in 10 dB steps. The output at A1A1/TP3 should drop in 10 dB steps. The dynamic range should be ≥60 dB.

8.7.6 Bandwidth Test

a. Connect the Signal Generator via BNC T-adapter to the 20.5 MHz IF INPUT of the CCA-7. Connect the third port of the T-adapter to a Frequency Counter. Set the Signal Generator output for 20.5 MHz at 5 mV. Set the ATTENUATOR switch to +40 dB position. Set the LOG/LIN switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the AC Voltmeter to A1A1/TP3 and tune the Signal Generator for maximum output at A1A1/TP3. Adjust 30-1000 MHz CALIBRATE control A1A1/R12 for exactly +3 dBm (316 mV) indication on the AC Voltmeter.

b.

For:	3 dB	6 dB	10 dB	20 dB bandwidth
The nominal values are:	94	116	140	190 kHz, tolerance ±10%

8.7.7 Gain Control Adjustment During Calibration

a. Using setup of Paragraph 8.7.4, apply a 10 mV, 20.5 MHz signal to the 20.5 MHz IF INPUT and measure 630 mV at A1A1/TP3 (G_V = 36 dB). Set the ATTENUATOR switch to CAL position and set trimpot A1A1/R29 to cw position. The signal level at A1A1/TP3 should rise to about 3 dB above 630 mV. Then set A1A2/R29 to ccw position. The signal level at A1A1/TP3 should drop to about 3 dB below 630 mV.

b. Adjust trimpot A1A1/R29 for 630 mV at A1A1/TP3.

NOTE

The procedure above is a test of the gain control range during calibration and preliminary adjustment. The final Cal Figure adjustment will be made when the CCA-7 is connected to an NM-37/57 EMI/FI Meter.

8.8 TEST AND ALIGNMENT OF THE 455 kHZ IF AMPLIFIER FOR 17.7 kHZ BANDWIDTH (see Figures 8-3 and 10-3)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in the LOCAL position.

8.8.1 Bandpass Filter Alignment

Connect the Signal Generator to the 455 kHz IF INPUT of the CCA-7. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz (C1), the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Set the Signal Generator for an output of 455 kHz at 10 mV and connect the AC Voltmeter to A1A1/TP3. Set the 0.15-30 MHz CALIBRATE control A1A1/R45 at mid-position and

tune transformer A1A1/T2 for maximum signal indication on the AC Voltmeter.

8.8.2 IF Gain Alignment

Using setup of Paragraph 8.8.1, adjust the 0.15-30 MHz CALIBRATE control A1A1/R45 for an output of 100 mV (G_V = 20 dB) at A1A1/TP3. Check the reserve gain. It should be approximately 5 dB. Check the gain control range. It should be approximately 10 dB. Return to the nominal gain of 20 dB.

8.8.3 Dynamic Range Test

a. Using setup of Paragraph 8.8.2, short A1/TP1 on the Mother Board to ground and increase the Signal Generator output until the distortion limit is reached at A1A1/TP3. The maximum undistorted output should be about 1.3 V rms.

b. Insert a 50-ohm, 10 dB Step Attenuator between Signal Generator and the 455 kHz IF INPUT of the CCA-7. Operate the Step Attenuator in 10 dB steps. The output at A1A1/TP3 should drop in 10 dB steps. The dynamic range should be $\geq$50 dB.

8.8.4 Bandwidth Test

a. Using setup of Paragraph 8.8.2, insert a BNC T-adapter at the output of the Signal Generator and connect the third port of the T-adapter to a Frequency Counter. Set the output of the Signal Generator for 10 mV at 455 kHz and tune the Signal Generator for maximum output at A1A1/TP3. Adjust the 0.15-30 MHz CALIBRATE control A1A1/R45 for exactly 100 mV (-7 dBm) indication on the AC Voltmeter.

b.

For:	3 dB	6 dB	10 dB	and 20 dB bandwidth
The nominal values are:	17.7	30.6	53	170 kHz, tolerance $\pm$10%

8.8.5 Gain Control Adjustment During Calibration

a. Using setup of Paragraph 8.8.2, reduce the Signal Generator output to 5 mV. The AC Voltmeter connected to A1A1/TP3 should indicate 50 mV (G_V = 20 dB). Then set the ATTENUATOR switch to CAL position. The output at A1A1/TP2 should rise to 56 mV (G_V = 21 dB). Readjust trimpot A1A1/R35 if necessary.

b. Set the FREQUENCY RANGE switch to ANSI 0.15-30 MHz and repeat step a. During calibration the output on A1A1/TP3 should rise to 53 mV (G_V = 20.5 dB). Readjust trimpot A1A1/R36 if necessary.

Note: The procedure above is only a preliminary adjustment of the Cal Figure. The final adjustment will be made when the CCA-7 is connected to an NM-17/27 EMI/FI Meter.

8.9 TEST AND ALIGNMENT OF THE 455 kHZ IF AMPLIFIER OF 200 Hz BANDWIDTH (See Figures 8-3 and 10-2)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in LOCAL position.

8.9.1 IF Gain Alignment

Connect the Signal Generator to the 455 kHz IF INPUT receptacle of the CCA-7. Set the FREQUENCY RANGE switch to CISPR 10-150 kHz (C3) position, the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the AC Voltmeter to A1A1/TP3. Set the Signal Generator output for 455 kHz at 10 mV and adjust the 10-150 kHz CALIBRATE control A1A1/R75 for an output of 250 mV (G_V = 28 dB) at A1A1/TP3. Check the reserve gain. It should be approximately 5 dB. Check the gain control range. It should be approximately 10 dB. Return to the nominal gain of 28 dB.

8.9.2 Dynamic Range Test

a. Using setup of Paragraph 8.9.1, short A1/TP1 on the Mother Board to ground and increase the Signal Generator output until the distortion limit is reached at A1A1/TP3. The maximum undistorted output should be about 3 V rms.

b. Insert a 50-ohm, 10 dB Step Attenuator between the Signal Generator and the 455 kHz IF INPUT of the CCA-7. Operate the Step Attenuator in 10 dB steps. The output at A1A1/TP3 should drop in 10 dB steps. The dynamic range should be >60 dB. Remove the short from A1/TP1.

8.9.3 Bandwidth Test

a. Using setup of Paragraph 8.9.1 insert a BNC T-adapter at the output of the Signal Generator and connect the third port of the T-Adapter to a Frequency Counter. Set the output of the Signal Generator for 455 kHz at 10 mV and tune the Signal Generator for maximum output at A1A1/TP3. Adjust the 10-150 kHz CALIBRATE control A1A1/R75 for exactly 250 mV (+1 dBm) indication on the AC Voltmeter.

b.

For:	3 dB	6 dB	10 dB	and 20 dB bandwidth
The nominal values are:	175	200	230	300 Hz, tolerance ±10%

8.9.4 Gain Control Adjustment During Calibration

a. Using setup of Paragraph 8.9.1, set the ATTENUATOR switch to CAL position. The output at A1A1/TP3 should rise to 316 mV (G_V = 30 dB). Readjust trimpot A1A1/R62 if necessary.

b. Set the FREQUENCY RANGE switch to ANSI 10-150 kHz and repeat step a. During calibration the output at A1A1/TP3 should drop to 223 mV (G_V = 27 dB). Readjust trimpot A1A1/R68 if necessary.

NOTE

Steps a and b are a preliminary adjustment of the Cal Figure. The final adjustment will be made when the CCA-7 is connected to an NM-17/27 EMI/FI Meter.

8.10 IF ATTENUATOR TESTS

Perform the following tests with the CCA-7 CONTROL MODE switch in LOCAL position.

8.10.1 10 dB Step Attenuator Test (see Figures 10-1 and 10-2)

a. Connect the Signal Generator to the 455 kHz IF INPUT of the CCA-7 and set the Signal Generator for an output of 455 kHz 100 mV. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz (C1), the ATTENUATOR switch to +50 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the AC Voltmeter to A1A1/TP3. Tune the Signal Generator for maximum output at A1A1/TP3 and adjust 0.15-30 MHz CALIBRATE control A1A1/R45 for exactly 1 V output at A1A1/TP3.

b. Short A1A2/TP1 (output of the detector driver) to ground and move the AC Voltmeter from test point A1A1/TP3 to A1/TP1 on the Mother Board. Rotate the ATTENUATOR switch sequentially from +50 dB to -20 dB positions and measure the IF Attenuator output at each position at A1/TP1.

In position:	+50	+40	+30	+20	+10	0	-10	-20 dB
Nominal level:	10 mV	31.6 mV	100 mV	316 mV	316 mV	316 mV	316 mV	1.0 V

Tolerance in all positions is ±5% (±0.5 dB).

c. Connect the Signal Generator to the 20.5 MHz IF INPUT of the CCA-7 and set the Signal Generator for an output of 20.5 MHz at 16 mV. Set the FREQUENCY RANGE switch to CISPR 30-1000 MHz position (C2), all other switches as listed in Step a. Connect the AC Voltmeter to A1A1/TP3. Tune the Signal Generator for maximum output at A1A1/TP3 and adjust the 30-1000 MHz CALIBRATE control A1A1/R12 for exactly 1 V output at A1A1/TP3.

d. Repeat Step b, then remove the short from A1A2/TP1.

8.10.2 5 dB Attenuator Test (see Figure 10-4)

a. Using setup of Paragraph 8.10.1, Step a., set the ATTENUATOR switch to +30 dB position and measure 1 V at A1A2/TP3. Move the AC Voltmeter from A1A1/TP3 to A1A2/TP1 and read a signal level of 1 V. Readjust 0.15-30 MHz CALIBRATE control if necessary.

b. Set 0 dB/+5 dB switch to +5 dB position. The signal level at A1A2/TP1 should drop by 5 dB, tolerance ±0.5 dB.

c. Using setup of Paragraph 8.10.1, Step c., set the ATTENUATOR switch to +30 dB position and measure 1 V at A1A1/TP3. Move the AC Voltmeter from A1A1/TP3 to A1A2/TP1 and read a signal level of 1 V. Readjust 30-1000 MHz CALIBRATE control if necessary.

d. Repeat Step b.

8.11 TEST OF THE DETECTOR DRIVER CIRCUIT (see Figure 10-3)

Perform the following tests with the CCA-7 CONTROL MODE switch in LOCAL position.

8.11.1 Gain Tests

a. Connect the Signal Generator to the 455 kHz IF INPUT receptacle and set the Signal Generator for 455 kHz at 10 mV output. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz position, the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect an AC Voltmeter to A1/TP1. Tune the Signal Generator for maximum indication at A1/TP1. It should be 31.6 mV. Realign 0.15-30 MHz CALIBRATE control if necessary.

b. Move the AC Voltmeter from A1/TP1 to A1A2/TP1. The output of the detector driver should be 316 mV, yielding a gain of 20 dB, tolerance $\pm$1.0 dB.

c. Connect the Signal Generator to the 20.5 MHz IF INPUT of the CCA-7 and set the Signal Generator for 20.5 MHz at 3.16 mV output. Set the FREQUENCY RANGE switch to CISPR 30-1000 MHz, the ATTENUATOR switch to +30 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the AC Voltmeter to A1/TP1. Tune the Signal Generator for maximum indication at A1/TP1. If should be 20 mV. Realign 30-1000 MHz CALIBRATE control if necessary.

d. Move the AC Voltmeter from A1/TP1 to A1A2/TP1. It should indicate 200 mV, yielding a 20 dB gain of the detector driver, tolerance $\pm$1.0 dB.

8.11.2 Dynamic Range Tests

a. Using setup of Paragraph 8.11.1, Step a., short A1A2/TP4 to ground and connect the AC Voltmeter and an Oscilloscope to the output of the detector driver A1A2/TP1. It should indicate 316 mV.

b. Increase the Signal Generator output until the distortion limit is noted at A1A2/TP1. The maximum undistorted output should be approximately 3.16 V rms.

c. Insert a 50-ohm, 10 dB Step Attenuator between the Signal Generator and IF INPUT of the CCA-7. Operate the Step Attenuator in 10 dB steps; the detector driver output at A1A2/TP1 should drop in 10 dB stpes; the dynamic range should be $\geq$60 dB.

d. Using setup of Paragraph 8.11.1, Step c., short test point A1A1/TP4 to ground and connect the AC Voltmeter and the Oscilloscope to the output of the detector driver A1A2/TP1. It should indicate 200 mV.

e. Repeat Step b.

f. Repeat Step c. Then remove the short from A1A2/TP4.

8.12 TEST OF THE DETECTOR CIRCUIT (see Figure 10-3)

Perform the following tests with the CCA-7 CONTROL MODE switch in LOCAL position.

8.12.1 Signal Level Tests

a. Connect the Signal Generator to the 20.5 MHz IF INPUT receptacle and set the Signal Generator output for 20.5 MHz at 3.16 mV. Set the FREQUENCY RANGE switch to CISPR 30-1000 MHz, the ATTENUATOR switch to +30 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the AC Voltmeter to A1A2/TP1 and the DVM to A1A2/TP4 (output of the QP detector). Tune the Signal Generator for maximum indication of the meters and adjust 30-1000 MHz CALIBRATE control for 200 mV on the AC Voltmeter. Read the DVM. It should indicate +500 mV ±5%.

b. Connect the Signal Generator to the 455 kHz IF INPUT of the CCA-7 and set the Signal Generator output for 455 kHz at 10 mV. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz, the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the AC Voltmeter to A1A2/TP1 and the DVM to A1A2/TP4. Tune the Signal Generator for maximum indication of the meters and adjust 0.15-30 MHz CALIBRATE control for 316 mV on the AC Voltmeter. Read the DVM. It should be +260 mV ±5%.

c. Using setup of Step b, set the FREQUENCY RANGE switch to CISPR 10-150 kHz, tune the Signal Generator for maximum indication on the meters and adjust 10-150 kHz CALIBRATE control for 900 mV on the AC Voltmeter. Read the DVM. It should be 260 mV ±5%.

d. Using setup of Step b, set the FREQUENCY RANGE switch to ANSI 10-150 kHz and repeat Step c. Read the AC Voltmeter. It should be 900 mV ±10%, and the DVM should be 320 mV ±5%.

8.12.2 Dynamic Range Tests

a. Using setup of Paragraph 8.12.1, Step a., short A1/TP2 on the Mother Board to ground and increase the Signal Generator output to obtain 3.16 V rms at the output of the detector driver at A1A2/TP1. The nominal Signal Generator output is 50 mV. Measure the dc level at the detector output at A1A2/TP4. It should be approximately +7.5 V.

b. Insert a 10 dB Step Attenuator between the Signal Generator and IF INPUT of the CCA-7 and operate the Step Attenuator from 0 to 60 dB in 10 dB steps. The ac level at A1A2/TP1 should drop in 10 dB steps from 3.16 V to 3.16 mV. The dc level at A1A2/TP4 should decrease continuously from +7.5 V to approximately +5 mV.

c. Using setup of Paragraph 8.12.1, Step b., short terminal A1/TP2 to ground and increase the Signal Generator output to measure 3.16 V rms at A1A2/TP1. The nominal Signal Generator output is 100 mV. Measure the dc level at A1A2/TP4. It should be approximately +2.5 V.

d. Repeat Step b. The dc level on A1A2/TP4 should decrease continuously from +2.5 V to approximately +2 mV.

e. Using setup of Paragraph 8.12.1, Step c., short A1/TP2 to ground and increase the Signal Generator output to obtain 3.16 V rms at A1A2/TP1.

The nominal Signal Generator output is 35 mV. Measure the dc level at A1A2/TP4. It should be approximately +0.9 V.

f. Repeat Step b., only operate the Step Attenuator from 0 to 50 dB. The dc level at A1A2/TP4 should decrease continuously from +0.9 V to approximately +2 mV. Then remove the short from A1/TP2.

8.13 TEST AND ALIGNMENT OF THE LINEAR VIDEO AMPLIFIER (see Figures 8-5 and 10-5)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in LOCAL position.

8.13.1 Linear Video Amplifier Gain Test

a. Connect the Signal Generator via a 50-ohm, 10 dB Step Attenuator to the 20.5 MHz IF INPUT of the CCA-7 and set the Signal Generator output to 20.5 MHz at 31.6 mV. Set the FREQUENCY RANGE switch to CISPR 30-1000 MHz (C2), the ATTENUATOR switch to +50 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the DVM to the output of the linear video amplifier at A1A3/TP1 and adjust the 30-1000 MHz CALIBRATE control for +5 V indication. Move the DVM to the input of the linear video amplifier A1A2/TP4 and measure a dc level of +500 mV $\pm$6% yielding a gain of 20 $\pm$0.5 dB.

b. Operate the Step Attenuator from 0 to 60 dB in 10 dB steps and simultaneously the CCA-7 ATTENUATOR switch from +50 dB to -10 dB position, also in 10 dB steps. At each step adjust the 30-1000 MHz CALIBRATE control for +5 V output at A1A3/TP1. Measure the input to the linear video amplifier at A1A2/TP4. The required values are listed in Table 8-3.

Table 8-3. Linear Video Amplifier Gain Versus ATTENUATOR Switch Position

10 dB Step Attenuator:	0	10	20	30	40	50	60 dB
ATTENUATOR Position:	+50	+40	+30	+20	+10	0	-10 dB
DC Level on A1A2/TP4:	500	500	500	500	158	50	15.8 mV $\pm$6%
Linear Video Amp Gain:	20	20	20	20	30	40	50 dB $\pm$0.5 dB

8.13.2 Linear Output Test

a. Using setup of Paragraph 8.13.1, Step a., measure the linear output to the dB meter at A1/TP2. It should be 1.0 V $\pm$20 mV. Observe that the dB meter deflects to 10 dB.

b. Connect the Signal Generator to the 455 kHz IF INPUT of the CCA-7 and set the Signal Generator output for 455 kHz at 100 mV. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz (C1), the ATTENUATOR switch to +40 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the DVM to the output of the linear video amplifier at A1A3/TP1 and adjust 0.15-30 MHz CALIBRATE control for +2.6 V

indication. Move the DVM to A1/TP2 and measure the linear output. It should be 1.0 V ±20 mV. Observe that the dB meter deflects to 20 dB.

c. Using setup of Step b., set the FREQUENCY RANGE switch to CISPR 10-150 kHz (C3) and repeat other directions in Step b. Measure the linear output at A1/TP2. It should again measure 1.0 V ±20 mV. Observe that the dB meter deflects to 20 dB.

8.13.3 10 dB Linear Meter Scale Tracking Test

a. Connect the Signal Generator via a 50-ohm, 1 dB Step Attenuator to the 20.5 MHz IF INPUT of the CCA-7. Set the Step Attenuator to 0 dB and the Signal Generator output to 20.5 MHz at 3.16 mV. Set the FREQUENCY RANGE switch to CISPR 30-1000 MHz (C2), the ATTENUATOR switch to +30 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the DVM to the linear output at A1/TP2. Tune the Signal Generator for maximum deflection of the dB meter and adjust the 30-1000 MHz CALIBRATE control for exactly 10 dB deflection. Measure 1.0 V ±20 mV at A1/TP2.

b. Operate the 1 dB Step Attenuator from 0 to 10 dB in 1 dB steps. Measure the linear output at A1/TP2 and read the dB meter at each step as listed in Table 8-4.

Table 8-4. 10 dB Linear Meter Scale

Step Attenuator:	0	1	2	3	4	5	6	7	8	9	10 dB
Linear Output	1000	888	787	698	619	548	485	429	380	336	296 mV
dB Meter Deflection:	10	9	8	7	6	5	4	3	2	1	0 dB

Tolerance of Linear Output: ±6%
Tolerance of dB Meter Deflection: ±0.5 dB

8.13.4 20 dB Linear Meter Scale Tracking Test

a. Connect the Signal Generator via 10 dB and 1 dB Step Attenuators to the 455 kHz IF INPUT of the CCA-7. Set the two Step Attenuators to 0 dB and the Signal Generator output to 455 kHz at 10 mV. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz (C1), the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the DVM to the linear output at A1/TP2. Tune the Signal Generator for maximum deflection of the dB meter and adjust the 0.15-30 MHz CALIBRATE control for exactly 20 dB deflection. Measure 1.0 V ±20 mV at A1/TP2.

b. Operate the 1 dB Step Attenuator from 0 to 10 dB in 1 dB steps. Measure the linear output at A1/TP2 and read the dB meter at each step as listed in Table 8-5.

Table 8-5. 20 dB Linear Meter Scale (10-20 dB)

Step Attenuator:	0	1	2	3	4	5	6	7	8	9	10 dB
Linear Output:	1000	888	787	698	619	548	485	429	380	336	296 mV
dB Meter Deflection:	20	19	18	17	16	15	14	13	12	11	10 dB

Tolerance of Linear Output: ±6%
Tolerance of dB Meter Deflection: ±0.5 dB

c. Set the 10 dB Step Attenuator to 10 dB and the 1 dB Step Attenuator to 0 dB. Then operate the 1 dB Step Attenuator from 0 to 10 dB in 2 dB steps. Measure the linear output at A1/TP2 and read the dB meter at each step as listed in Table 8-6.

Table 8-6. 20 dB Linear Meter Scale 0-10 dB

Step Attenuator:	10	12	14	16	18	20 dB
Linear Output:	296	234	185	145	113	88 mV, tolerance ±12%
dB Meter Deflection:	10	8	6	4	2	0 dB, tolerance ±1 dB

8.14 TEST AND ALIGNMENT OF THE LOG VIDEO AMPLIFIER (see Figures 8-2, 8-5, 10-1 and 10-4)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in LOCAL position.

8.14.1 Log Amplifier Transfer Slope and Offset Alignment

a. Connect the Signal Generator via a 10 dB Step Attenuator to the 20.5 MHz IF INPUT of the CCA-7. Set the Signal Generator for 20.5 MHz at 3.16 mV output and set the Step Attenuator for 0 dB. Set the FREQUENCY RANGE switch of the CCA-7 to 30-1000 MHz, the ATTENUATOR switch to +30 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Connect the DVM to the linear output at A1/TP2 and adjust 30-1000 MHz CALIBRATE control for 1.000 V at A1/TP2. Measure the buffer amplifier U2 output at A1A3/TP2 to 1.000 V.

b. Move the DVM to the Y OUTPUT on the rear panel and align trimpot A1A3/R44 (transfer slope) for an output of +1.000 V. Check the level at A1A3/TP3. The nominal level is -10 V.

c. Set the Step Attenuator to 30 dB and measure the linear output at A1/TP2. It should be approximately 20 mV. Measure the log output on the Y OUTPUT receptacle. It should be 240 mV. Readjust trimpot A1A3/R39 (offset) if necessary. There is interaction between the transfer slope and offset alignment. Go back and forth several times, until both values are correct.

d. Set the Step Attenuator to 40 dB and measure the linear output at A1/TP2. It should be approximately 6 mV. Check the log output on the Y OUTPUT receptacle. It should be 0 mV. Readjust trimpot A1A3/R38 if necessary.

8.14.2 Meter Substituting Resistor Alignment

In the setup of Paragraph 8.14.1, Step b., measure 1.000 V on the Y OUTPUT. Set the LIN/LOG switch to LOG position. The Y OUTPUT should stay exactly 1.000 V. Realign trimpot A1/R14 (meter substituting resistor when the log meter scale is in use) if necessary to obtain the correct value.

8.14.3 Y OUTPUT Test

a. Using setup of Paragraph 8.14.1, Step b., operate the Step Attenuator from 0 to 40 dB in 10 dB steps and measure the Y OUTPUT:

Step Attenuator:	0	10	20	30	40 dB
Y OUTPUT:	1000	764	514	242	0 mV tolerance ±50 mV

b. Connect the Signal Generator via a 10 dB Step Attenuator to the 455 kHz IF INPUT. Set the Step Attenuator to 0 dB and the Signal Generator for 455 kHz at 10 mV output. Set the FREQUENCY RANGE switch to 0.15-30 MHz, the ATTENUATOR switch to +20 dB, LIN/LOG switch to LIN and 0 dB/+5 dB switch to 0 dB position. Connect the DVM to the Y OUTPUT and adjust 0.15-30 MHz CALIBRATE control for 1.000 V at the Y OUTPUT.

c. Operate the Step Attenuator from 0 to 40 dB in 10 dB steps and measure the Y OUTPUT. Values should be:

Step Attenuator:	0	10	20	30	40 dB
Y OUTPUT:	1000	764	524	276	48 mV tolerance ±50 mV

d. Set the FREQUENCY RANGE switch to 10-150 kHz and proceed with other directions described in Step b.

e. Repeat Step c.

8.14.4 +10 dB to -30 dB Log Meter Scale Tracking Test

a. Using setup of Paragraph 8.14.1, Step a., insert a 1 dB Step Attenuator ahead of the 20.5 MHz IF INPUT receptacle and set both Step Attenuators to 0 dB. Set the LIN/LOG switch to LOG position and connect the DVM to the Y OUTPUT receptacle (log output). Tune the Signal Generator for maximum meter deflection and adjust 30-1000 MHz CALIBRATE control for +10 dB. Measure 1.000 V ±20 mV at the Y OUTPUT.

b. Operate the 1 dB and 10 dB Step Attenuators in 2 dB steps from 0 to 40 dB. Measure the log output and read the dB meter at each step as listed in Table 8-7.

Table 8-7. +10 dB to -30 dB Log Meter Scale

Step Atten:	0	2	4	6	8	10	12	14	16	18	20 dB
Log Output:	1000	953	906	853	812	764	715	666	616	566	514 mV
Meter Defl.:	+10	+8	+6	+4	+2	0	-2	-4	-6	-8	-10 dB
Step Atten:	20	22	24	26	28	30	32	34	36	38	40 dB
Log Output:	514	462	409	354	298	242	186	131	81	36	0 mV
Meter Defl.:	-10	-12	-14	-16	-18	-20	-22	-24	-26	-28	-30 dB

Tolerance from +10 dB to -20 dB meter deflection ±1 dB, ±25 mV.
Tolerance from -20 dB to -30 dB meter deflection ±2 dB, ±50 mV.

8.14.5 +20 dB to -20 dB Log Meter Scale Tracking Test

a. Using setup of Paragraph 8.14.3, Step b., insert a 1 dB Step Attenuator ahead of the 455 kHz IF INPUT receptacle and set both Step Attenuators to 0 dB. Set the LIN/LOG switch to LOG and proceed as described in Paragraph 8.14.4, Step a.

b. Proceed as described in Paragraph 8.14.4, Step b. Measure the log output and read the dB meter deflection as listed in Table 8-8.

Table 8-8. +20 dB to -20 dB Log Meter Scale

Step Atten:	0	2	4	6	8	10	12	14	16	18	20 dB
Log Output:	1000	955	906	859	812	764	716	668	620	572	524 mV
Meter Defl.:	+20	+18	+16	+14	+12	+10	+8	+6	+4	+2	0 dB
Step Atten:	20	22	24	26	28	30	32	34	36	38	40 dB
Log Output:	524	476	426	370	326	276	226	178	132	87	48 mV
Meter Defl.:	0	-2	-4	-6	-8	-10	-12	-14	-16	-18	-20 dB

Tolerance from +20 dB to -10 dB meter deflection ±1 dB, ±25 mV
Tolerance from -10 dB to -20 dB meter deflection ±2 dB, ±50 mV

8.15 CALIBRATION FIGURE TEST AND ALIGNMENT (see Figures 8-3 and 10-2)

Perform the following tests and alignments with the CCA-7 CONTROL MODE switch in LOCAL position.

8.15.1 Cal Figure Test and Alignment, 30-1000 MHz Frequency Range

a. Connect the Signal Generator via a 50-ohm, 10 dB Step Attenuator to the RF INPUT of NM-37/57. Set the CONTROL MODE switch of the

NM-37/57 to LOCAL position, the BAND switch to 30-57 MHz, the BANDWIDTH switch to 1 MHz, the FUNCTION switch to FIELD INTENSITY and the ATTENUATOR switch to 0 dB position. Set the Signal Generator output to 40 MHz -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB and tune the NM-37/57 for maximum signal indication. Adjust the CALIBRATION control of the NM-37/57 for 40 dB meter deflection. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 30-1000 MHz, the ATTENUATOR switch to +30 dB, the LIN/LOG switch to LIN, and the 0 dB/+5 dB switch to 0 dB position. Retune the NM-37/57 for maximum meter deflection on the CCA-7 and adjust the 30-1000 MHz CALIBRATE control of the CCA-7 for exactly 10 dB meter deflection.

b. Set the FUNCTION switch of the NM-37/57 to CALIBRATE position and read the Cal Figure. It should be 30 dB. Set the ATTENUATOR switch of the CCA-7 to CAL position and read the Cal Figure of the CCA-7. It should be 10 dB $\pm$0.25 dB. Readjust A1A1/R29 if necessary.

8.15.2 Cal Figure Test and Alignment, 0.15-30 MHz Frequency Range

a. Connect the Signal Generator via a 50-ohm, 10 dB Step Attenuator to the RF INPUT of the NM-17/27. Set the CONTROL MODE switch to LOCAL position, the BAND switch to 1-2 MHz, the BANDWIDTH switch to 10 kHz, the FUNCTION switch to FIELD INTENSITY and the ATTENUATOR switch to 0 dB position. Set the Signal Generator output to 1.1 MHz -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB and tune the NM-17/27 for maximum signal indication. Adjust the CALIBRATE control of the NM-17/27 for 40 dB meter deflection. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 0.15-30 MHz, the ATTENUATOR switch to +20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Retune the NM-17/27 for maximum meter deflection on the CCA-7 and adjust the 0.15-30 MHz CALIBRATE control of the CCA-7 for exactly 20 dB meter deflection.

b. Set the FUNCTION switch of the NM-17/27 to CALIBRATE position and read the Cal Figure. It should be 30 dB. Set the ATTENUATOR switch of the CCA-7 to CAL position and read the Cal Figure. It should be 20 dB. Realign trimpot A1A1/R35 if necessary.

c. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 0.15-30 MHz and repeat all other directions of Step a.

d. Repeat Step b. Realign trimpot A1A1/R36 if necessary.

8.15.3 Cal Figure Test and Alignment, 10-150 kHz Frequency Range

a. Connect the Signal Generator via a 50-ohm, 10 dB Step Attenuator to the RF INPUT of the NM-17/27. Set the CONTROL MODE switch to LOCAL position, the BAND switch to 0.01-0.25 MHz, the BANDWIDTH switch to 10 kHz, the FUNCTION switch to FIELD INTENSITY and the ATTENUATOR switch to 0 dB position. Set the Signal Generator output to 100 kHz at -47 dBm (1 mV), the 10 dB Step Attenuator to 20 dB and tune the NM-17/27 for maximum signal indication. Adjust the CALIBRATE control of the NM-17/27 for 40 dB meter deflection. Set the FREQUENCY RANGE switch of the CCA-7 to CISPR 10-150 kHz, the ATTENUATOR switch to

+20 dB, the LIN/LOG switch to LIN and the 0 dB/+5 dB switch to 0 dB position. Retune the NM-17/27 for maximum meter deflection on the CCA-7 and adjust the 10-150 kHz CALIBRATE control of the CCA-7 for exactly 20 dB meter deflection.

b. Set the FUNCTION switch of the NM-17/27 to CALIBRATE position and read the Cal Figure. It should be 30 dB. Set the ATTENUATOR switch of the CCA-7 to CAL position and read the Cal Figure of the CCA-7. It should be 20 dB. Realign trimpot A1A1/R62 if necessary.

c. Set the FREQUENCY RANGE switch of the CCA-7 to ANSI 10-150 kHz and repeat all other directions of Step a.

d. Repeat Step b. Realign trimpot A1A1/R68 if necessary.

8.16 TIME CONSTANT TESTS

Perform the following tests with the CCA-7 CONTROL MODE switch in the LOCAL position.

8.16.1 Charge and Discharge Time, 30-1000 MHz Frequency Range

Apply approximately 30 mV, 5 ms bursts of 20.5 MHz signal with PRF = 0.5 to the 20.5 MHz IF Input of the CCA-7. Set the FREQUENCY RANGE to CISPR 30-1000 MHz, the Attenuator to +50 dB and observe the pulse amplitude (PA), charge time T_{CH} and the discharge time T_D at A1A3/TP1, the nominal values: T_{CH} = 1 ms $\pm$20%, T_D = 600 ms $\pm$20%, PA = 3V.

8.16.2 Charge and Discharge Time, 0.15-30 MHz Frequency Range

a. Apply approximately 30 mV 5 ms burst of 455 kHz signal with PRF = 0.5 to the 455 kHz IF Input of the CCA-7. Set the FREQUENCY RANGE to CISPR 0.15-30 MHz, Attenuator +30 dB and observe PA, T_{CH} and T_D on A1A3/TP1. Adjust the input level for PA = 3 V and measure T_{CH} = 1 ms $\pm$20%, T_D = 160 ms $\pm$20%.

b. Set the FREQUENCY RANGE switch to ANSI 0.15-30 MHz and repeat all other directions of Step a. PA and T_{CH} stay unchanged but T_D increases to 600 ms $\pm$20%.

8.16.3 Charge and Discharge Time, 10-150 kHz Frequency Range

a. Set the FREQUENCY RANGE switch to CISPR 10-150 kHz and apply approximately 30 mV at 0.3 sec. burst of 455 kHz signal with PRF - 0.5

to the 455 kHz IF Input of the CCA-7. Set the Attenuator to +30 dB and observe PA, T_{CH} and T_D on A1A3/TP1. Adjust the input level for PA = 3V and measure T_{CH} = 50 ms ±20%, T_D = 460 ms ±20%.

b. Set the FREQUENCY RANGE switch to ANSI 10-150 MHz and repeat all other directions of Step a., measure T_{CH} = 5 ms ±20% and T_D = 600 ms ±20%.

8.16.4 Meter Time Constant, 30-1000 MHz Frequency Range

a. Set the FREQUENCY RANGE switch to CISPR 30-1000 MHz, the ATTENUATOR switch to +20 dB and the LIN/LOG switch to LIN position. Apply approximately +0.5 V, 0.2 Hz square wave to the pin of A1A3J1.

b. Adjust the signal amplitude for full scale meter deflection during the 2.5 sec pulse time.

c. Increase the signal frequency until the meter deflection is reduced to 35% of the full scale deflection, or 1.3 dB on the 10 dB linear scale.

d. Connect an oscilloscope to A1A3J1 and determine the pulse width in milliseconds as the time constant of the meter.

8.16.5 Meter Time Constant, 0.15-30 MHz Frequency Range

a. Set the FREQUENCY RANGE switch to CISPR 0.15-30 MHz, the ATTENUATOR switch to +20 dB and the LIN/LOG switch to LIN position. Apply approximately +0.25 V, 0.2 Hz square wave to the pin of A1A3J1.

b. Repeat Step b of Paragraph 8.16.4.

c. Increase the signal frequency until the meter deflection is reduced to 35% of the full scale deflection, or 11.3 dB on the 20 dB linear scale.

d. Repeat Step d of Paragraph 8.16.4.

8.16.6 Meter Time Constant, 10-150 kHz Frequency Range

a. Set the FREQUENCY RANGE switch to CISPR 10-150 kHz and then proceed as described in Step a., Paragraph 8.16.5.

b. Repeat Step b., Paragraph 8.16.4.

c. Repeat Step c., Paragraph 8.16.5.

d. Repeat Step d., Paragraph 8.16.4.

8.17 REMOTE OPERATION (see Figure 10-1)

When the CCA-7 passes all the Minimum Performance tests of Section VII, except for Programmable Control, Paragraph 7.3.28, troubleshoot as follows:

a. Determine which J5 ground closure pins do not perform the prescribed function on ground closure. Refer to Table 3-2. For those faulty pin functions found, check the circuit performance of the related level translators (Q5 through Q21) and logic diodes.

b. Proper function of J5, pins "f" and "g", depends on the stretching circuit consisting of A1U4 and A1Q1 through A1Q4. Refer to Paragraph 6.3.1 for circuit description. A1R28 is a bias control that is adjusted for zero output at pin "f" when the stretched signal is dumped.

c. The remaining J5 pins require only continuity checks when function problems are encountered.

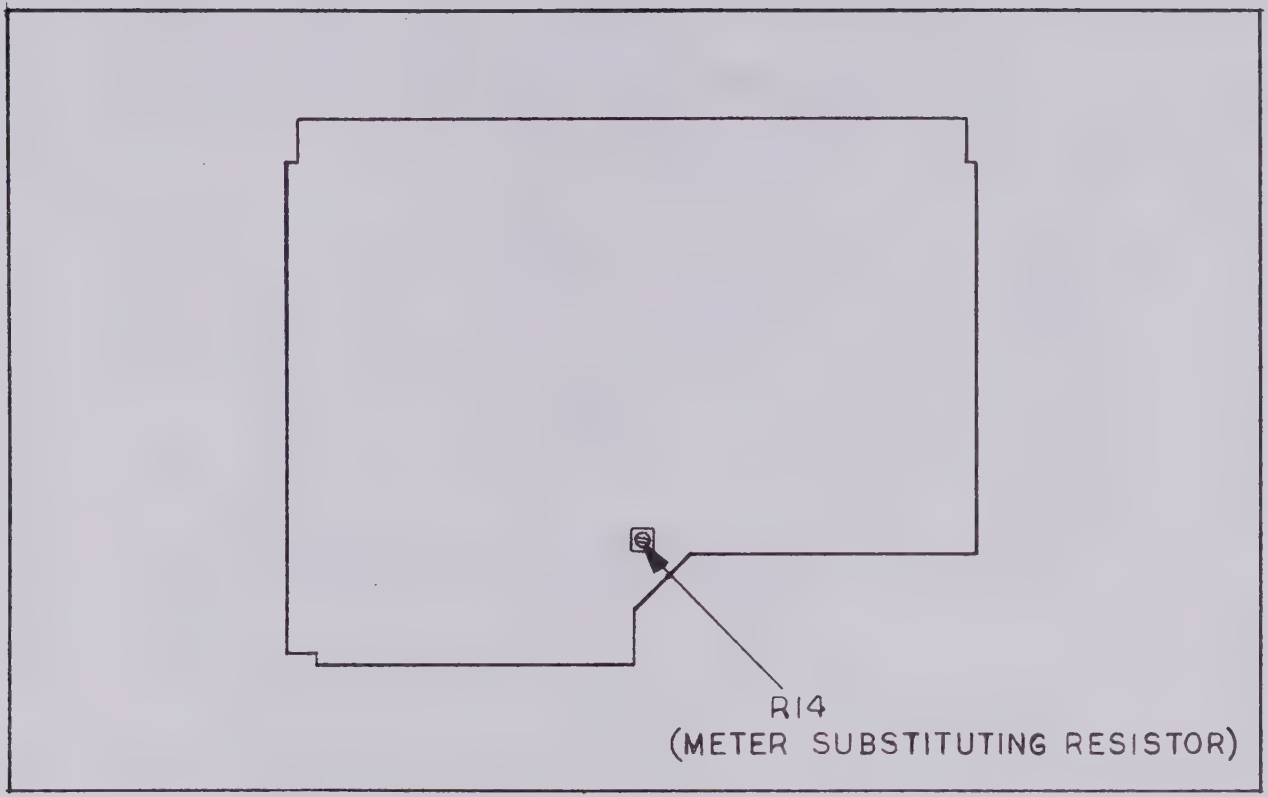


Figure 8-2. Trimmer Locations, Mother Board Assy, A1

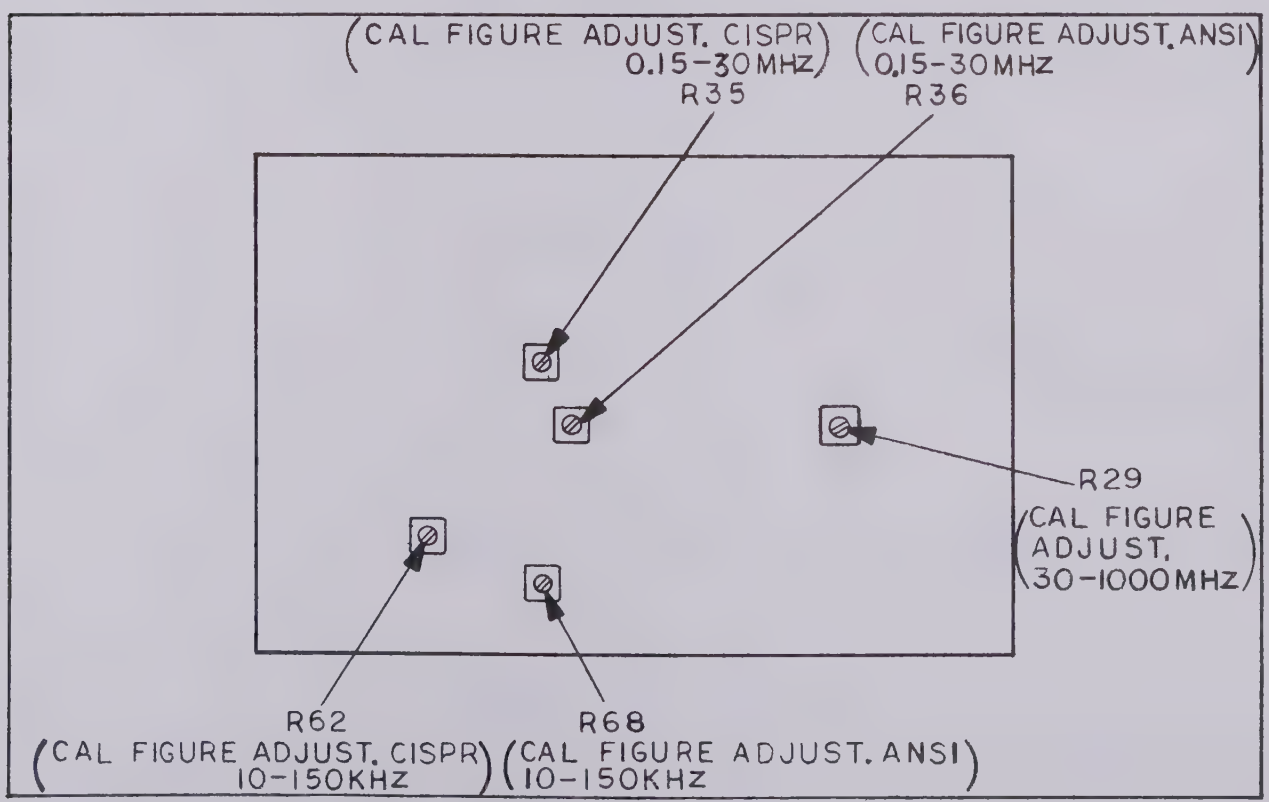


Figure 8-3. Trimmer Locations, IF Converter & IF Amplifiers Assy, A1A1

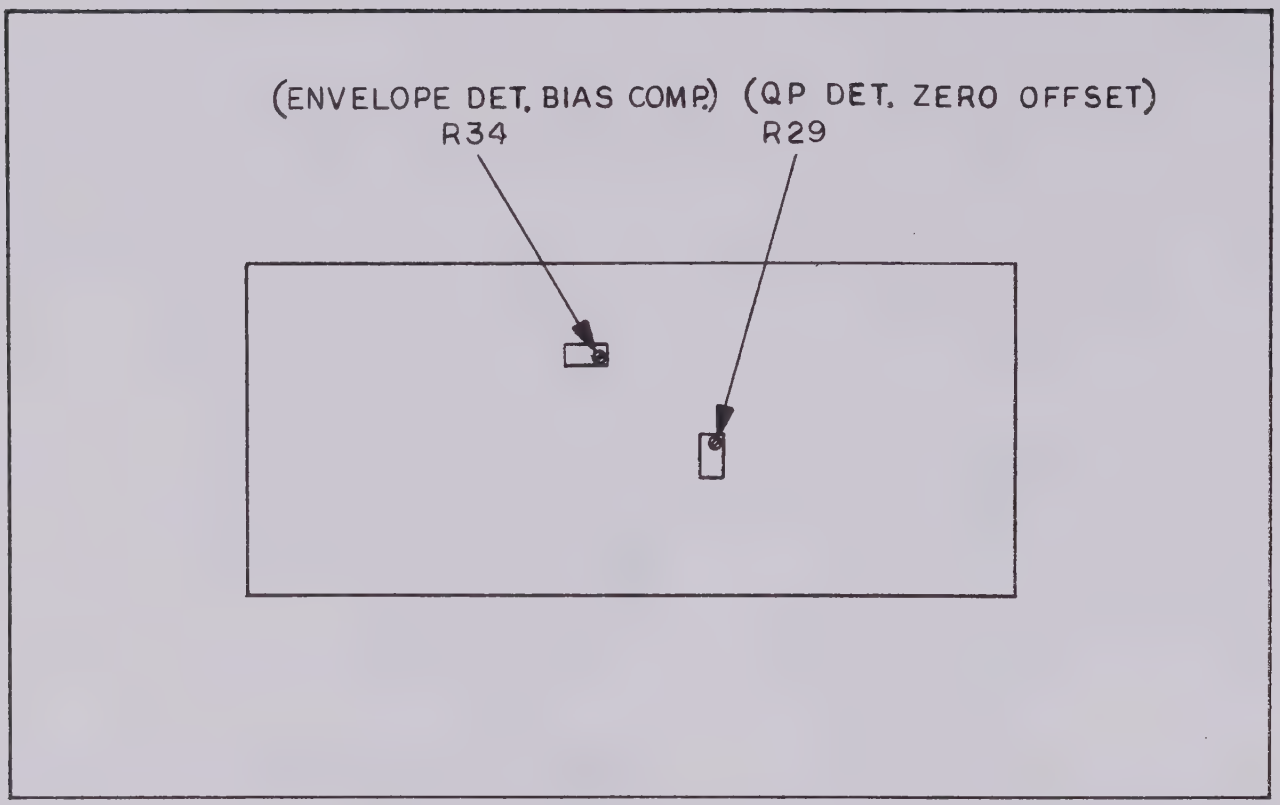


Figure 8-4. Trimmer Locations, Detector Driver and Q. P. Detector, A1A2

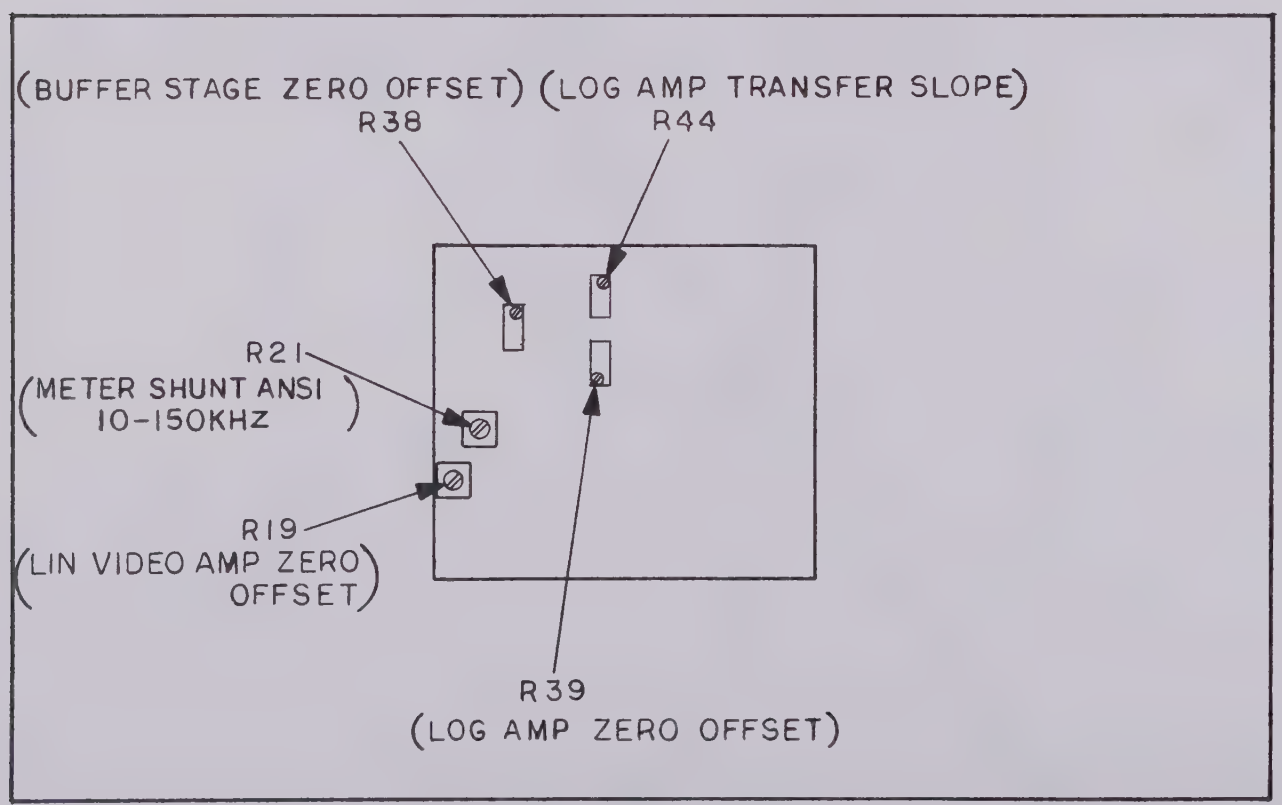


Figure 8-5. Trimmer Locations, Linear and Log Video Amplifiers, A1A3

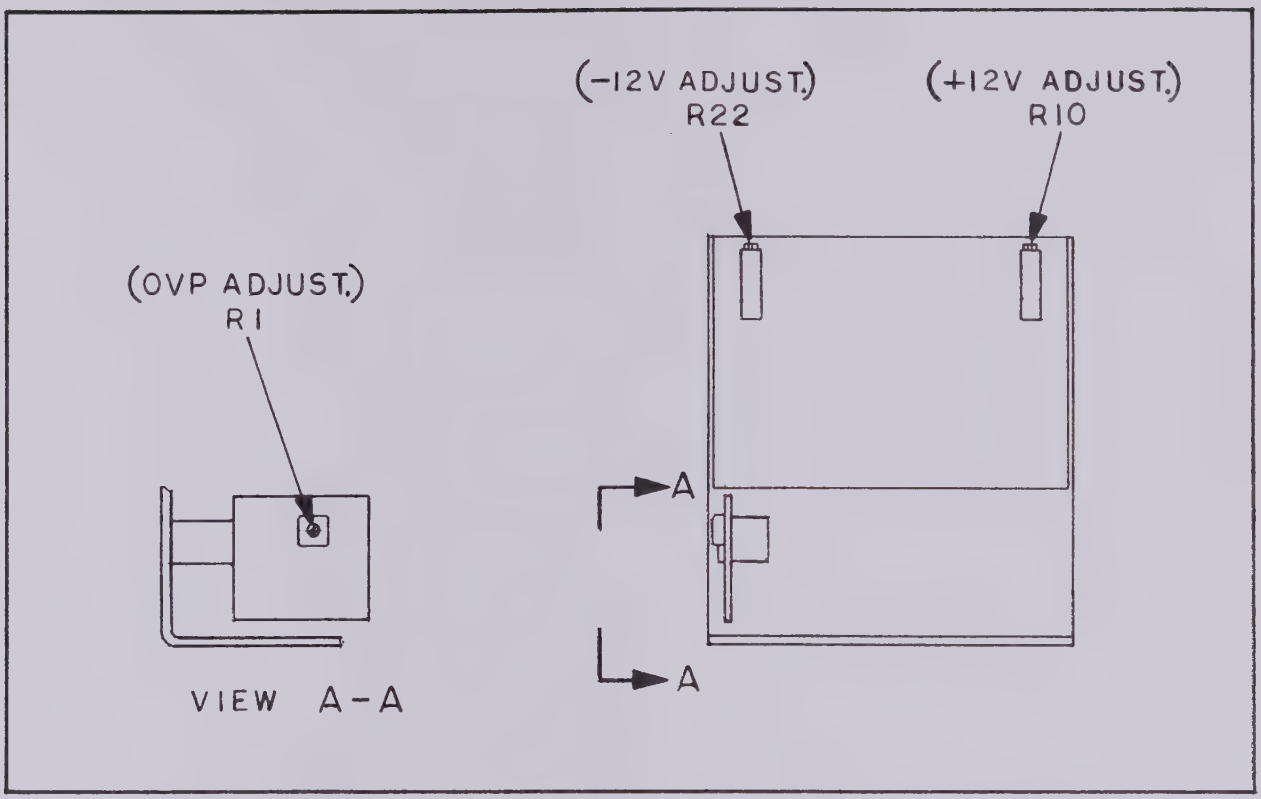


Figure 8-6. Trimmer Locations, Power Supply, Dual Output and Dual Tracking, Model XM15 Series, A5

Section IX

REPLACEABLE PARTS

9.1 INTRODUCTION

This section includes all pertinent data necessary to locate, identify, and procure additional parts for the equipment. Parts are listed alpha-numerically by reference symbol and include all replaceable electronic items. Satisfactory replacement may be made with either the listed component or an exact replacement of the part(s) removed from the equipment.

9.2 ORDERING INFORMATION

The following instructions will aid in ordering parts:

a. Address all inquiries or orders to:

CUSTOMER SERVICE DEPARTMENT
Eaton Corporation
5340 Alla Road
Los Angeles, California 90066

b. Include the following information:

(1) Model and serial number of instrument.
(2) Ailtech part number.
(3) Reference symbol number.
(4) Description (as shown on parts list).

9.3 PARTS LIST USE

The Table of Contents at the front of the manual lists the Parts List tables, related assemblies and location. The following paragraphs describe the use and meaning of the five columns included in the Parts List starting with Table 9-4.

a. Reference Designation, Column 1

The Reference Designation column contains an alpha-numeric listing of parts as they appear on the equipment chassis, illustration, or schematic. The reference designation identifies the parts as to their component function in the instrument. Refer to Table 9-2.

b. Ailtech Part Number, Column 2

The Ailtech Part Number column contains the part number as designated by Ailtech.

c. Description, Column 3

The Description column contains the identification of component parts, including all pertinent specifications. When the description column is used for a reference symbol for which no part exists, "Not Used" is placed in the column. In these instances columns 2, 4 and 5 are left blank. Refer to Table 9-3 on abbreviations that are used in the parts list.

d. Manufacturer's Code Number, Column 4

The Manufacturer's Code Number column references the manufacturer by an assigned code number, as listed in Federal Supply Code Handbook H4-2. For manufacturers not listed in the Handbook, a letter code will be assigned. Table 9-1 includes the manufacturer and his code designation.

e. Manufacturer's Part Number, Column 5

The Manufacturer's Part Number shown contains the part number as designated by the manufacturer of the part.

Table 9-1. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbook H4-2.

Code No.	Manufacturer	Address
00779	AMP, Inc.	Harrisburg, PA
00853	Sangamo Electric Co.	Marrion, IL
01121	Allen-Bradley Co.	Milwaukee, WI
02111	Spectrol Electronics Corp.	City of Industry, CA
02735	RCA Semiconductors and Materials Div.	Sommerville, NJ
03508	GE Semiconductor Prod. Div.	Syracuse, NY
04062	Elmenco Products Co.	New York, NY
04651	Sylvania Elect. Prods, Microwave Service Div.	Mountain View, CA
04713	Motorola, Inc.	Phoenix, AZ
05245	Corcom, Inc.	Chicago, IL
07263	Fairchild Semiconductor Corp.	Mountain View, CA
09353	C and K Components, Inc.	Newton, MA
13919	Burr-Brown Research Corp.	Tucson, AZ
14674	Corning Glass Works, Electronic Component Dept.	Corning, NY
14752	Electro Cube	South Pasadena, CA
14908	Electronic Instruments and Specialty Corp.	Stoneham, ME
17856	Siliconix, Inc.	Santa Clara, CA
18324	Signetics Corp.	Sunnyvale, CA
24355	Analog Devices	Norwood, MA
24759	Lenox-Fugle Electronics, Inc.	South Plainfield, NJ
27014	National Semiconductor Corp.	Santa Clara, CA
28480	Hewlett-Packard	Palo Alto, CA

Table 9-1. Code List of Manufacturers (cont.)

Code No.	Manufacturer	Address
31951	Triridge Corp.	Pittsburg, PA
50434	Hewlett-Packard	Palo Alto, CA
53279	Xentex, Inc.	San Marcos, CA
56289	Sprague Electric Co.	North Adams, MA
71400	Bussman Mfg.	St. Louis, MO
72982	Erie Resistor Corp.	Erie, PA
73138	Beckman Instruments, Inc., Helipot Div.	Fullerton, CA
73445	Amperex Electronics Co.	Hicksville, NY
74840	Illinois Capacitor Sales Co., Inc.	Morton Grove, IL
76433	General Instrument Co.	Newark, NJ
77068	The Bendix Corp., Electrondynamics Div.	North Hollywood, CA
82389	Switchcraft	Chicago, IL
88869	Eaton Corp., Ailtech Division	Los Angeles, CA
94375	Automatic Connector, Inc.	Commack, NY
95121	Quality Components, Inc.	St. Marys, PA

Table 9-2. Reference Designators

A	Assembly	M	Meter
AR	Amplifier	P	Plug, Connector
AT	Attenuator/Isolator	Q	Transistor
C	Capacitor	R	Resistor
CP	Adapter	RT	Thermistor
CR	Diode	S	Switch
DS	Lamp	T	Transformer
F	Fuse	U	Integrated Circuit
FL	Filter, Ferrite Beads (RF Choke)	W	Cable
		X	Holder, Socket
HY	Sampler	Y	Crystal, VCO
J	Jack, Connector	Z	Miscellaneous Parts:
K	Relay		Mixer
L	Inductor		Modulator

Table 9-3. Abbreviations

A	Ampere	p	Pico (10^{-12})
dc	Direct current	pF	Picofarad
Desig.	Designator	Ref.	Reference
I_F	Forward current	RF	Radio Frequency
k	Thousand	V	Volt
m	Milli (10^{-3})	V_r	Reverse voltage
mA	Milliampere	W	Watts
Mfr.	Manufacturer	μ	Micro (10^{-6})
No.	Number	μF	Microfarad
P/O	Part of	μH	Microhenry
%	±% if sign not shown		

Table 9-4. Parts List for Main Assemblies and Chassis

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No	Mfr. Part No.
-	4-005530-001	Unit Assembly, CCA-7	88869	
A1	4-005331-001	Assembly, Mother Board	88869	
A1A1	4-005378-001	Assembly, IF Amplifier and Converter	88869	
A1A2	3-005379-001	Assembly, Detector Driver and Q.P. Detector	88869	
A1A3	3-005381-001	Assembly, Linear and Log Video	88869	
A2	1-968013-001	Assembly, Power Supply	53279	XM15-12 w/ovp DT
CR1	1-913049-007	Diode, LED, V_f = 2 V max., I_f = 50 mA max.	50434	5082-4850
F1	1-924000-115	Fuse, Normal blow, 0.5A, 250 V dc	71400	AGC-.5 Amp
J1		P/O W1		
J2		P/O W2		
J3		P/O W3		
J4	1-910330-001	Module, power input	05245	6J4
J5		P/O W5		
M1	4-404058-001	Meter, output	88869	
S1	1-951024-002	Switch, push-push, 1 pole, 2 positions	82389	65017-206
S2		Not used		
S3		Not used		
S4	1-951042-003	Switch, toggle, 1 pole, 2 positions	09353	7101PDZB
S5	1-951042-007	Switch, toggle, 4 poles, 2 positions	09353	7401PDZB
W1 thru W3	2-005397-001	Cable, coaxial, 6-1/2 inches	88869	
W4	3-005533-001	Assembly, Harness, Front Panel	88869	
W5	4-005532-001	Assembly, Harness Rear Panel	88869	

Table 9-5. Parts List for Mother Board Assembly, A1

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No	Mfr. Part No
C1	1-900057-150	Capacitor, Electrolytic, 4.7 µF, ±20%, 35 V	56289	150D475X0035B2
C2	1-900057-150	Capacitor, Electrolytic, 4.7 µF, ±20%, 35 V	56289	150D475X0035B2
C3	1-900066-015	Capacitor, Ceramic, .47 pF, ±10%, 500 V	95121	MC0.47 ±10%
C4	1-900057-150	Capacitor, Electrolytic, 4.7 µF, ±20%, 35 V	56289	150D475X0035B2
C5	1-900057-150	Capacitor, Electrolytic, 4.7 µF, ±20%, 35 V	56289	150D475X0035B2
C6	1-900091-001	Capacitor, Polycarbon, 1 µF, ±5%, 50 V	14752	625B1A105J
CR1 thru CR22	1-913058-002	Diode, Germanium V_r = 100 V, I_f = 100 mA	04651	1N277
CR23 thru CR29		Not used		
CR30 thru CR34	1-913058-002	Diode, Germanium V_r = 100 V, I_f = 100 mA	04651	1N277
CR35		Not used		
CR36 thru CR61	1-913058-002	Diode, Germanium V_r = 100 V, I_f = 100 mA	04651	1N277
CR62	1-913007-001	Diode, Silicon V_r = 75 V, I_f = 100 mA	03508	1N4148
CR63	1-91308 6-001	Diode, Signal	07263	1N3595
CR64	1-913007-001	Diode, Silicon V_r = 75 V, I_f = 100 mA	03508	1N4148
CR65	1-913007-001	Diode, Silicon V_r = 75 V, I_f = 100 mA	03508	1N4148
CR66 thru CR71	1-913058-002	Diode, Germanium V_r = 100 V, I_f = 100 mA	04651	1N277

Table 9-5. Parts List for Mother Board Assembly, A1 (cont.)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
J1		Connector, Jack, P/O P.C. Board, 18 pins	88869	
J2		Connector, Jack, P/O P.C. Board, 3 pins	88869	
J3		Connector, Jack, P/O P.C. Board, 18 pins	88869	
J4		Connector, Jack, P/O P.C. Board, 3 pins	88869	
J5		Connector, Jack, P/O P.C. Board, 18 pins	88869	
K1	1-942017-001	Relay, Reed, SPST Form Coil: 12 V dc, 3k ohms	31951	206-00049
K2 thru K9		Not used		
K10	1-942017-001	Relay, Reed, SPST Form, Coil: 12 V dc, 3k ohms	31951	206-00049
K11	1-942018-001	Relay, Reed, DPST Form, Coil: 12 V dc, 2.5k ohms	31951	206-00050
K12	1-942019-001	Relay, Red, SPDT Form, Coil: 12 V dc, 3k ohms	31951	206-00052
Q1	1-958000-001	Transistor, FET, N-Channel	04713	2N5458
Q2	1-958000-001	Transistor, FET, N-Channel	04713	2N5458
Q3	1-958002-002	Transistor, Silicon, NPN	04713	2N3904
Q4	1-958002-002	Transistor, Silicon, NPN	04713	2N3904
Q5 thru Q21	1-958000-002	Transistor, Silicon, PNP	04713	2N3906
R1	1-945027-191	Resistor, Film, 953 ohms, ±1%, 1/8 W	14674	RN55-D-9530F
R2	1-945027-191	Resistor, Film, 953 ohms, ±1%, 1/8 W	14674	RN55-D-9530F

Table 9-5. Parts List for Mother Board Assembly, A1 (cont.)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R3	1-945027-207	Resistor, film, 1.4 kilohm, ±1%, 1/8 W	14674	RN55-D-1401F
R4	1-945027-211	Resistor, film, 1.54 kilohm, ±1%, 1/8 W	14674	RN55-D-1541F
R5	1-945027-211	Resistor, film, 1.54 kilohm, ±1%, 1/8 W	14674	RN55-D-1541F
R6	1-945027-155	Resistor, film, 402 ohms, ±1%, 1/8 W	14674	RN55-D-4020F
R7	1-945027-217	Resistor, film, 1.78 kilohm, ±1%, 1/8 W	14674	RN55-D-1781F
R8	1-945027-217	Resistor, film, 1.78 kilohm, ±1%, 1/8 W	14674	RN55-D-1781F
R9	1-945027-107	Resistor, film, 127 ohms, ±1%, 1/8 W	14674	RN55-D-1270F
R10	1-945027-219	Resistor, film, 1.87 kilohm, ±1%, 1/8 W	14674	RN55-D-1871F
R11	1-945027-219	Resistor, film, 1.87 kilohm, ±1%, 1/8 W	14674	RN55-D-1871F
R12	1-945027-059	Resistor, film, 40.2 ohm, ±1%, 1/8 W	14674	RN55-D-40R2F
R13		Not used		
R14	1-945162-008	Resistor, variable, cermet, 2 kilohm, ±20%, 1/2 W	73138	72PR2K
R15 thru R19	1-945001-154	Resistor, composition 470 ohm, ±5%, 1/2 W	01121	EB4715
R20	1-945027-385	Resistor, film, 100 kilohm, ±1%, 1/8 W	14674	RN55-D-1003F
R21	1-945162-010	Resistor, variable, cermet, 10 kilohm, ±20%, 1/2 W	73138	72PR10K
R22	1-945027-385	Resistor, film, 100 kilohm, ±1%, 1/8 W	14674	RN55-D-1003F
R23	1-945000-126	Resistor, composition, 33 ohm, ±5%, 1/4 W	01121	CB3305

Table 9-5. Parts List for Mother Board Assembly, A1 (cont.)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R24	1-945000-178	Resistor, composition, 4.7 kilohm, +5%, 1/4 W	01121	CB4725
R25	1-945000-170	Resistor, composition, 2.2 kilohm, ±5%, 1/4 W	01121	CB2225
R26	1-945000-170	Resistor, composition, 2.2 kilohm, ±5%, 1/4 W	01121	CB2225
R27	1-945000-146	Resistor, composition, 220 ohm, ±5%, 1/4 W	01121	CB2215
R28	1-945162-008	Resistor, variable, cermet 2 kilohm, ±5%, 1/2 W	73138	72PR2K
R29	1-945027-097	Resistor, film, 100 ohm, ±1%, 1/8 W	14674	RN55-D-1000F
R30 thru R34	1-945000-162	Resistor, composition, 1 kilohm, ±5%, 1/4 W	01121	CB1025
R35	1-945000-185	Resistor, composition, 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R36	1-945000-162	Resistor, composition, 1 kilohm, ±5%, 1/4 W	01121	CB1025
R37	1-945000-185	Resistor, composition, 9.1 kilohms, ±5%, 1/4 W	01121	CB9125
R38	1-945000-162	Resistor, composition, 1 kilohm, ±5%, 1/4 W	01121	CB1025
R39	1-945000-185	Resistor, composition, 9.1 kilohm, ±1%, 1/4 W	01121	CB9125
R40	1-945000-162	Resistor, composition, 1 kilohm, ±5%, 1/4 W	01121	CB1025
R41	1-945000-185	Resistor, composition, 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R42	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R43	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R44	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025

Table 9-5. Parts List for Mother Board Assembly, A1 (cont.)

Mfr. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R45	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R46	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R47	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R48	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R49	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R50	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R51	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R52	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R53	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R54	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R55	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R56	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R57	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R58	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R59	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R60	1-945000-162	Resistor, composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R61	1-945000-185	Resistor, composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125

Table 9-5. Parts List for Mother Board Assembly, A1 (cont.)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R62	1-945000-162	Resistor, Composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R63	1-945000-185	Resistor, Composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R64	1-945000-162	Resistor, Composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R65	1-945000-185	Resistor, Composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
R66	1-945000-162	Resistor, Composition 1 kilohm, ±5%, 1/4 W	01121	CB1025
R67	1-945000-185	Resistor, Composition 9.1 kilohm, ±5%, 1/4 W	01121	CB9125
S1		Not used		
S2	1-404056-001	Switch, Rotary, 2 poles, 6 positions	88859	
S3	1-404057-001	Switch, Rotary, 3 poles, 9 positions	88869	
S4		Not used		
S5		Not used		
S6	1-404151-001	Switch, Rotary, 6 poles, 2 positions	88869	
U1	1-926140-001	Switch, Solid State, CMOS, 4 Individual S.T. Switches	24355	AD7510D1JN
U2	1-926140-001	Switch, Solide State, CMOS, 4 Individual S.T. Switches	24355	AD7510D1JN
U3	1-926036-002	IC, op amp	07263	µA741HC
U4	1-926036-002	IC, op amp	07263	µA741HC
XA1A1J1		Connector, jack, P/O P.C. Board, 3 pin	88869	
XA1A1J2		Connector, jack, P/O P.C. Board 1 pin	88869	
XA1A1J3		Connector, jack, P/O P.C. Board 3 pin	88869	

Table 9-5. Parts List for Mother Board Assembly, A1 (cont.)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No	Mfr. Part No.
XA1A1J4 thru XA1A1J9		Connector, jack, P/O P.C. Board 1 pin	88869	
XA1A1J10		Not used		
XA1A1J11		Connector, jack, P/O P.C. Board 3 pin	88869	
XA1A1J12		Not used		
XA1A1J13 thru XA1A1J15		Connector, jack, P/O P.C. Board 1 pin	88869	
XA1A2J1 thru XA1A2J12		Connector, jack, P/O P.C. Board 1 pin	88869	
XA1A3J1 thru XA1A3J13		Connector, jack, P/O P.C. Board 1 pin	88869	

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C1	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ±20%, 25 Vdc	72982	5835-000-Y5U-203Z
C2	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C3	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-102Z
C4	1-900098-042	Capacitor, fixed, mica, 300 pF, ± 5%, 50 Vdc	04062	DM5FY301J
C5	1-900098-010	Capacitor, fixed, mica, 12 pF, ± 5%, 300 Vdc	04062	DM5CC120J
C6	1-900098-042	Capacitor, fixed, mica, 300 pF, ± 5%, 50 Vdc	04062	DM5FY301J
C7	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-102Z
C8	1-900072-036	Capacitor, fixed, mica, 620 pF, ± 5%, 100 Vdc	00853	D10S1D621JO
C9	1-900072-036	Capacitor, fixed, mica, 620 pF, ± 5%, 100 VDC	00853	D10S1D621JO
C10	1-900072-036	Capacitor, fixed, mica, 620 pF, ± 5%, 100 Vdc	00853	D10S1D621JO
C11	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C12	1-900098-042	Capacitor, fixed, mica, 300 pF, ± 5%, 50 Vdc	04062	DM5FY301J
C13	1-900098-010	Capacitor, fixed, mica, 12 pF, ± 5%, 300 Vdc	04062	DM5CC120J
C14	1-900098-042	Capacitor, fixed, mica, 300 pF, ± 5%, 50 Vdc	04062	DM5FY301J
C15	1-900098-042	Capacitor, fixed, mica, 620 pF, ± 5% 100 Vdc	00853	D10S1D621JO

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C16	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C17	1-900057-146	Capacitor, fixed, electrolytic, 1 μF, ± 20%, 35 Vdc	56289	150D105X0035A2
C18	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C19	1-900098-035	Capacitor, fixed, mica, 150 pF, ± 5%, 100 Vdc	04062	DM5FA151J
C20	1-900098-035	Capacitor, fixed, mica, 150 pF, ± 5%, 100 Vdc	04062	DM5FA151J
C21	1-900076-001	Capacitor, fixed, ceramic, 0.01 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-103Z
C22	1-900076-001	Capacitor, fixed, ceramic 0.01 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-103Z
C23	1-900098-020	Capacitor, fixed, mica, 39 pF, ± 5%, 300 Vdc	04062	DM5EC390J
C24	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C25	1-900076-004	Capacitor, fixed, ceramic 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C26	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C27	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C28	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C29	1-900012-013	Capacitor, fixed, ceramic, 0.002 μF, ±10%, 500 V	72982	871-000-X5U-202K
C30	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ±20%, 25 Vdc	72982	5835-000-Y5U-203Z

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C31	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20% 25 Vdc	72982	5835-000-Y5U-104Z
C32	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C33	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C34	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C35	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C36	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C37	1-900098-039	Capacitor, fixed, mica, 220 pF, ± 5%, 50 Vdc	04062	DM5FY221J
C38	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C39	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C40	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C41	1-900076-002	Capacitor, fixed, ceramic 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C42	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C43	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C44	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C45	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C46	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C47	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C48	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C49	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-104Z
C50	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C51	1-900076-002	Capacitor, fixed, ceramic, 0.02 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-203Z
C52	1-900076-004	Capacitor, fixed, ceramic, 0.1 μF, ± 20%, 25 Vdc	72982	5835-000-Y5U-102Z
C53	1-900057-146	Capacitor, fixed, electrolytic, 1 μF, ± 20%, 35 Vdc	56289	150D105X0035A2
CR1	1-913098-001	Diode, silicon, V_r = 35 V, I_f = 10 mA	04713	MPN3401
CR2	1-913098-001	Diode, silicon, V_r = 35 V, I_f = 10 mA	04713	MPN3401
CR3	1-913098-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR4	1-913098-001	Diode, silicon, V_r = 35 V, I_f = 10 mA	04713	MPN3401
CR5	1-913007-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR6	1-913007-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR7	1-913098-001	Diode, silicon, V_r = 35 V, I_f = 10 mA	04713	MPN3401

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
CR8	1-913098-001	Diode, silicon, V_r = 35 V, I_f = 10 mA	04713	MPN3401
CR9	1-913007-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR10	1-913007-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR11	1-913007-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR12	1-913007-001	Diode, silicon, V_r = 75 V, I_f = 10 mA	03508	IN4148
CR13	1-913098-001	Diode, silicon, V_r = 35 V, I_f = 10 mA	04713	MPN3401
FL1	1-403948-001	Filter, crystal, bandpass, 455 kHz	88869	
J1	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J2	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J3	1-950031-003	Connector, jack, 3 socket	00779	2-332070-5
J4	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J5	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J6	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J7	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J8	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J9	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J10		Not used		
J11	1-950031-003	Connector, jack, 3 sockets	00779	2-332070-5
J12		Not used		

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
J13	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J14	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J15	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
L1	1-005393-001	Inductor, variable, 30 μH to 65 μH	88869	
L2	1-005393-001	Inductor, variable, 30 μH to 65 μH	88869	
L3	1-005393-001	Inductor, variable, 30 μH to 65 μH	88869	
L4	1-005393-001	Inductor, variable, 30 μH to 65 μH	88869	
L5	1-906016-031	Inductor, fixed, 33 μH, ± 10%, 190 mA	24759	DR-33
L6	1-906016-025	Inductor, fixed, 10 μH, ± 10%, 450 mA	24759	DR-10
Q1	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q2	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q3	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q4	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q5	1-958085-001	Transistor, N-channel, FET	04713	2N5486
Q6	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q7	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q8	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q9	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q10	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q11	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5

Table 9-6. Parts L st for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
Q12	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q13	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q14	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q15	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q16	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q17	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q18	153-3038-001	Transistor, N-channel, FET	17856	E-111
R1	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R2	1-945000-174	Resistor, fixed, composition, 3.3 kilohm, ± 5%, 1/4W	01121	CB3325
R3	1-945000-131	Resistor, fixed, composition, 51 ohm, ± 5%, 1/4W	01121	CB5105
R4	1-945000-164	Resistor, fixed, composition, 1.2 kilohm, ± 5%, 1/4 W	01121	CB1225
R5	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705
R6	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R7	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R8	1-945000-164	Resistor, fixed, composition, 1.2 kilohm, ± 5%, 1/4 W	01121	CB1225
R9	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705
R10	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R11	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R12	1-404059-002	Resistor, variable, cermet, 1 kilohm, ± 20%, 2 W	88869	
R13	1-945000-150	Resistor, fixed, composition, 330 ohm, ± 5%, 1/4 W	01121	CB3315
R14	1-945000-189	Resistor, fixed, composition, 13 kilohm, ± 5%, 1/4 W	01121	CB1335
R15	1-945000-169	Resistor, fixed, composition, 2 kilohm, ± 5%, 1/4 W	01121	CB2025
R16	1-945000-179	Resistor, fixed, composition, 5.1 kilohm, ± 5%, 1/4 W	01121	CB5125
R17	1-945000-134	Resistor, fixed, composition, 68 ohm, ± 5%, 1/4 W	01121	CB6805
R18	1-945000-174	Resistor, fixed, composition 3.3 kilohm, ± 5%, 1/4 W	01121	CB3325
R19	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R20	1-945000-192	Resistor, fixed, composition, 18 kilohm, ± 5%, 1/4 W	01121	CB1835
R21	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1021
R22	1-945000-170	Resistor, fixed, composition 2.2 kilohm, ± 5%, 1/4 W	01121	CB2225
R23	1-945000-150	Resistor, fixed, composition, 330 ohm, ± 5%, 1/4 W	01121	CB3315
R24	1-945000-218	Resistor, fixed, composition, 220 kilohm, ± 5%, 1/4 W	01121	CB2245
R25	1-945000-178	Resistor, fixed, composition, 4.7 kilohm, ± 5%, 1/4 W	01121	CB4725
R26	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R27	1-945000-174	Resistor, fixed, composition, 3.3 kilohm, ± 5%, 1/4 W	01121	CB3325

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R28	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R29	1-945162-007	Resistor, variable, cermet, 1 kilohm, ± 20%, 1/2 W	01121	E2A102
R30	1-945000-174	Resistor, fixed, composition, 3.3 kilohm, ± 5%, 1/4 W	01121	CB3325
R31	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R32	1-945000-172	Resistor, fixed, composition, 2.7 kilohm, ± 5%, 1/4 W	01121	CB2725
R33	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705
R34	1-945000-178	Resistor, fixed, composition, 4.7 kilohm, ± 5%, 1/4 W	01121	CB4725
R35	1-945162-006	Resistor, fixed, composition, 500 ohm, ± 5%, 1/2 W	01121	E2A501
R36	1-945162-009	Resistor, variable, cermet, 5 kilohm, ± 20%, 1/2 W	01121	E2A502
R37	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R38	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R39	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5% 1/4 W	01121	CB1045
R40	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R41	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R42	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R43	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R44	1-945000-218	Resistor, fixed, composition, selected, 220 kilohm nominal, ± 5%, 1/4 W	01121	CB2245
R45	1-404059-003	Resistor, variable, cermet, 5 kilohm, ± 20%, 2 W	88869	
R46	1-945000-168	Resistor, fixed, composition, 1.8 kilohm, ± 5% 1/4 W	01121	CB1825
R47	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R48	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R49	1-945000-169	Resistor, fixed, composition, 2 kilohm, ± 5%, 1/4 W	01121	CB2025
R50	1-945000-161	Resistor, fixed, composition, 910 ohm, ± 5%, 1/4 W	01121	CB9115
R51	1-945000-168	Resistor, fixed, composition, 1.8 kilohm, ± 5%, 1/4 W	01121	CB1825
R52	1-945000-174	Resistor, fixed, composition, 3.3 kilohm, ± 5%, 1/4 W	01121	CB3325
R53	1-945000-192	Resistor, fixed, composition, 18 kilohm, ± 5%, 1/4 W	01121	CB1835
R54	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R55	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R56	1-945000-131	Resistor, fixed, composition, 51 ohm, ± 5%, 1/4 W	01121	CB5105

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R57	1-945000-174	Resistor, fixed, composition, 3.3 kilohm, ± 5%, 1/4 W	01121	CB3325
R58	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R59	1-945000-155	Resistor, fixed, composition, 510 ohm, ± 5%, 1/4 W	01121	CB5115
R60	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705
R61	1-945000-170	Resistor, fixed, composition, 2.2 kilohm, ± 5%, 1/4 W	01121	CB2225
R62	1-945162-007	Resistor, variable, cermet, 1 kilohm, ± 20%, 1/2 W	01121	E2A102
R63	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R64	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R65	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R66	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R67	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R68	1-945162-008	Resistor, variable, cermet, 2 kilohm, ± 20%, 1/2 W	01121	E2A202
R69	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R70	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R71	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R72	1-945000-138	Resistor, fixed, composition, 100 ohm, ± 5%, 1/4 W	01121	CB1015
R73	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R74	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R75	1-404059-001	Resistor, variable, cermet, 500 ohm, ± 20%, 2W	88869	
R76	1-945000-144	Resistor, fixed, composition, 180 ohm, ± 5%, 1/4 W	01121	CB1815
R77	1-945000-189	Resistor, fixed, composition, 13 kilohm, ± 5%, 1/4 W	01121	CB1335
R78	1-945000-179	Resistor, fixed, composition, 5.1 kilohm, ± 5%, 1/4 W	01121	CB5125
R79	1-945000-169	Resistor, fixed, composition, 2 kilohm, ± 5%, 1/4 W	01121	CB2025
R80	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705
R81	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R82	1-945000-174	Resistor, fixed, composition, 3.3 kilohm, ± 5%, 1/4 W	01121	CB3325
R83	1-945000-192	Resistor, fixed, composition, 18 kilohm ± 5%, 1/4 W	01121	CB1835
R84	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025

Table 9-6. Parts List for IF Amplifiers and IF Converter Assembly, A1A1 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R85	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R86	1-945000-210	Resistor, fixed, composition, 100 kohm, ± 5%, 1/4 W	01121	CB1045
R87	1-945000-186	Resistor, fixed, composition, 10 kohm, ± 5%, 1/4 W	01121	CB1035
R88	1-945000-150	Resistor, fixed, composition, selected 330 ohm nominal, ± 5%, 1/4 W	01121	CB3315
R89	1-945000-160	Resistor, fixed, composition, selected 820 ohm nominal, ± 5%, 1/4 W	01121	CB8215
R90	1-945000-154	Resistor, fixed, composition, selected 470 ohm nominal, ± 5%, 1/4 W	01121	CB4715
T1	1-005394-001	Transformer, variable, 0.35μH to 0.85μH	88869	
T2	1-005396-001	Transformer, variable, 490μH to 540μH	88869	
Y1	1-404060-001	Crystal, 18.9 MHz	88869	
Z1	1-403915-001	Mixer, double balanced	88869	

Table 9-7. Parts List for Detector Driver and Quasi Peak Detector Assembly, A1A2

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C1	1-900076-002	Capacitor, fixed, ceramic, 0.02μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-203Z
C2	1-900057-111	Capacitor, fixed, electrolytic 2.2μF, ± 20%, 20 Vdc	56289	150D225X9020A2
C3	1-900076-004	Capacitor, fixed, ceramic, 0.1μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-102Z
C4	1-900076-004	Capacitor, fixed, ceramic, 0.1μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-102Z
C5	1-900057-111	Capacitor, fixed, electrolytic, 2.2μF, ± 20%, 20 Vdc	56289	150D225X9020A2
C6	1-900076-004	Capacitor, fixed, ceramic, 0.1μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-102Z
C7	1-900076-004	Capacitor, fixed, ceramic, 0.1μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-102Z
C8	1-900057-111	Capacitor, fixed, electrolytic, 2.2μF, ± 20%, 25 Vdc	56289	150D225X9020A2
C9	1-900079-004	Capacitor, fixed, ceramic, 0.1μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-102Z
C10	1-900079-004	Capacitor, fixed, ceramic, 0.1μF, ± 20%, 25 Vdc	72982	5835-000-Y5U0-102Z
C11	1-900098-035	Capacitor, fixed, mica, 150 pF, ± 5%, 100 Vdc	04062	DM5FA151J
C12	1-900098-023	Capacitor, fixed, mica, 50 pF, ± 5%, 300 Vdc	04062	DM5EC500J
C13	1-900098-035	Capacitor, fixed, mica, 150 pF, ± 5%, 100 Vdc	04062	DM5FA151J
C14	1-900091-007	Capacitor, fixed, polycarbon, 3μF, ± 5%, 50 Vdc	14752	625B1A305J

Table 9-7. Parts List for Detector Driver and Qausi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C15	1-900057-150	Capacitor, fixed, electrolytic, 4.7μF, ± 20%, 35 Vdc	56289	150D475X0035B2
C16	1-900057-150	Capacitor, fixed, ceramic, 4.7μF, ± 20%, 35 Vdc	56289	150D475X0035B2
C17	1-900098-016	Capacitor, fixed, ceramic, 27 pF, ± 5%, 300 Vdc	04062	DM5EC270J
C18	1-900057-111	Capacitor, fixed, electrolytic, 2.2μF, ± 20%, 20 Vdc	56289	150D225X9020A2
CR1	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR2	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR3	1-913055-001	Diode, silicon, Vr = 70 V, I_f = 15 mA	28480	HP5082-2800
CR4	1-913055-001	Diode, silicon, Vr = 70 V, I_f = 15 mA	28480	HP5082-2800
CR5	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR6	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR7	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR8	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR9	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR10	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148

Table 9-7. Parts List for Detector Driver and Quasi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
CR11	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR12	1-913045-001	Diode, silicon, Vr = 25 V, I_f = 30 mA	03508	IN4154
CR13	1-913045-001	Diode, silicon, Vr = 25 V, I_f = 30 mA	03508	IN4154
CR14	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR15	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR16	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR17	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
J1	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J2	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J3	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J4	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J5	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J6	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J7	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J8	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5

Table 9-7. Parts List for Detector Driver and Quasi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
J9	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J10	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J11	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J12	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
K1	1-942020-001	Relay, 2 poles, 2 positions Coil: 12 Vdc, 700 ohm	31951	206-00070
K2	1-942024-001	Relay, 1 pole, 1 position, Coil: 12 Vdc, 1125 ohm	14908	TP-12
K3	1-942024-001	Relay: 1 pole, 1 position, Coil: 12 Vdc, 1125 ohm	14908	TP-12
K4	1-942024-001	Relay, 1 pole, 1 position, Coil: 12 Vdc, 1125 ohm	14908	TP-12
K5	1-942024-001	Relay, 1 pole, 1 position, Coil: 12 Vdc, 1125 ohm	14908	TP-12
L1	1-916016-037	Inductor, fixed, 100 μH, ± 10%, 120 mA	24759	DR-100
L2	1-916016-037	Inductor, fixed, 100 μH, ± 10%, 120 mA	24759	DR-100
Q1	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q2	1-95800-002	Transistor, silicon, PNP	04713	2N3906-5
Q3	1-958000-001	Transistor, silicon, NPN	04713	2N3904-5
Q4	1-958000-002	Transistor, silicon, PNP	04713	2N3906-5
Q5	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q6	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q7	153-3038-001	Transistor, N-channel, FET	17856	E-111

Table 9-7. Parts List for Detector Driver and Qausi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R1	1-945027-169	Resistor, fixed, film 562 ohm, ± 1%, 1/8 W	14674	RN55-D-5620 F
R2	1-945027-169	Resistor, fixed, film, 562 ohm, ± 1%, 1/8 W	14674	RN55-D-5620 F
R3	1-945027-243	Resistor, fixed, film, 3.32 kilohm, ± 1%, 1/8 W	14674	RN55-D-3321F
R4	1-945027-231	Resistor, fixed, film 2.49 kilohm, ± 1%, 1/8 W	14674	RN55-D-2491F
R5	1-945000-192	Resistor, fixed, composition, 18 kilohm, ± 5%, 1/4 W	01121	CB1835
R6	1-945000-194	Resistor, fixed, composition, 22 kilohm, ± 5%, 1/4 W	01121	CB2235
R7	1-945000-162	Resistor, fixed, composition, 1 kilohm, ± 5%, 1/4 W	01121	CB1025
R8	1-945027-210	Resistor, fixed, film, 1.5 kilohm, ± 1%, 1/8 W	14674	RN55-D-1501F
R9	1-945027-118	Resistor, fixed, film, 165 ohm, ± 1%, 1/8 W	14674	RN55-D-1650F
R10	1-945000-180	Resistor, fixed, composition, 5.6 kilohm, ± 5%, 1/4 W	01121	CB5625
R11	1-945000-146	Resistor, fixed, composition, 220 ohm, ± 5%, 1/4 W	01121	CB2215
R12	1-945000-148	Resistor, fixed, composition, 270 ohm, ± 5%, 1/4 W	01121	CB2715
R13	1-945000-170	Resistor, fixed, composition, 2.2 kilohm, ± 5%, 1/4 W	01121	CB2225
R14	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705

Table 9-7. Parts List for Detector Driver and Quasi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R15	1-945000-122	Resistor, fixed, composition, 22 ohm, ± 5%, 1/4 W	01121	CB2205
R16	1-945000-122	Resistor, fixed, composition, 22 ohm, ± 5%, 1/4 W	01121	CB2205
R17	1-945000-130	Resistor, fixed, composition, 47 ohm, ± 5%, 1/4 W	01121	CB4705
R18	1-945000-188	Resistor, fixed, composition, 12 kilohm, ± 5%, 1/4 W	01121	CB1235
R19	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R20	1-945000-178	Resistor, fixed, composition, 4.7 kilohm, ± 5%, 1/4 W	01121	CB4725
R21	1-945000-200	Resistor, fixed, composition, 39 kilohm, ± 5%, 1/4 W	01121	CB3935
R22	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R23	1-945000-150	Resistor, fixed, composition, 330 ohm, ± 5%, 1/4 W	01121	CB3315
R24	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R25	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R26	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R27	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R28	1-945000-202	Resistor, fixed, composition, 47 kilohm, ± 5%, 1/4 W	01121	CB4735
R29	1-945163-007	Resistor, variable, cermet, 1 kilohm, ± 10%, 1/2 W	02111	64Y102T000

Table 9-7. Parts List for Detector Driver and Quasi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R30	1-945027-318	Resistor, fixed, film, 20 kilohm, ± 1%, 1/8 W	14674	RN55-D-2002F
R31	1-945027-237	Resistor, fixed, film, 2.87 kilohm, ± 1%, 1/8 W	14674	RN55-D-2871F
R32	1-945027-285	Resistor, fixed, film, 9.09 kilohm, ± 1%, 1/8 W	14674	RN55-D-9091F
R33	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R34	1-945163-108	Resistor, variable, cermet, 2 kilohm, ± 10%, 1/2 W	02111	64Y202T000
R35	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R36	1-945027-135	Resistor, fixed, film, 249 ohm, ± 1%, 1/8 W	14674	RN55-D-2490F
R37	1-945027-309	Resistor, fixed, film, 16.2 kilohm, ± 1%, 1/8 W	14674	RN55-D-1622F
R38	1-945027-088	Resistor, fixed, film, 80.6 ohm, ± 1%, 1/8 W	14674	RN55-D-80R6F
R39	1-945027-414	Resistor, fixed, film, 200 kilohm, ± 1%, 1/8 W	14674	RN55-D-2003F
R40	1-945000-226	Resistor, fixed, composition, 470 kilohm, ± 5%, 1/4 W	01121	CB4745
R41	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R42	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R43	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045

Table 9-7. Parts List for Detector Driver and Quasi Peak Detector Assembly, A1A2 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R44	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R45	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R46	1-945027-374	Resistor, fixed, film 76.8 kilohm, ±1%, 1/8 W	14674	RN55-D-7682F
R47	1-945000-210	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R48	1-945000-200	Resistor, fixed, composition, 39 kilohm, ± 5%, 1/4 W	01121	CB3935
T1	1-005395-001	Transformer, variable, 1.04 mH to 1.15 mH	88869	
U1	1-926036-002	Integrated circuit, operational amplifier	07263	741HC
U2	1-926133-001	Integrated circuit, operational amplifier	27014	LM201AH
U3	84-18	Integrated circuit, voltage follower	27014	LM202H

Table 9-8. Parts List for Linear and Log Video Amplifiers Assembly, A1A3

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
C1		Not used		
C2	1-900057-076	Capacitor, fixed, electrolytic, 150 µF, ± 10%, 10 Vdc	56289	150D157X9010R2
C3	1-900057-039	Capacitor, fixed, electrolytic, 330µF, ± 10%, 6Vdc	56289	150D337X9006R2
C4	1-900039-008	Capacitor, fixed, electrolytic, 50 µF, -10% + 75%, 15 Vdc	76433	984-1655
C5	1-900001-109	Capacitor, fixed, plastic, 0.047 µF, ± 10%, 250 Vdc	73445	C280AE, 0.047 µF
C6	1-900001-109	Capacitor, fixed, plastic, 0.047 µF, ± 10%, 250 Vdc	73445	C280AE, 0.047 µF
C7	1-900001-109	Capacitor, fixed, plastic, 0.047 µF, ± 10%, 250 Vdc	73445	C280AE, 0.047 µF
C8	1-900001-109	Capacitor, fixed, plastic, 0.047 µF, ± 10%, 250 Vdc	73445	C280AE, 0.047 µF
C9	1-900057-150	Capacitor, fixed, electrolytic, 4.7 µF, ± 20%, 35 Vdc	56289	150D475X0035B2
C10	1-900057-150	Capacitor, fixed, electrolytic, 4.7 µF, ± 20%, 35 Vdc	56289	150D475X0035B2
CR1	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR2	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR3	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR4	1-913007-001	Diode, silicon, Vr = 75V, I_f = 10 mA	03508	IN4148
CR5	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148

Table 9-8. Parts List for Linear and Log Video Amplifiers Assembly, A1A3 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
CR6	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR7	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR8	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
CR9	1-913007-001	Diode, silicon, Vr = 75 V, I_f = 10 mA	03508	IN4148
J1	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J2	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J3	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J4	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J5	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J6	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J7	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J8	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J9	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J10	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
J11	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5

Table 9-8. Parts List for Linear and Log Video Amplifiers Assembly, A1A3 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
J12	1-950031-003	Connector, jack 1 socket	00779	2-332070-5
J13	1-950031-003	Connector, jack, 1 socket	00779	2-332070-5
Q1	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q2	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q3	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q4	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q5	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q6	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q7	153-3038-001	Transistor, N-channel, FET	17856	E-111
Q8	153-3038-001	Transistor, N-channel, FET	17856	E-111
R1	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R2	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R3	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R4	1-945027-226	Resistor, fixed, film, 2.21 kilohm, ± 1%, 1/8 W	14674	RN55-D-2211F
R5	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R6	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R7	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045

Table 9-8. Parts List for Linear and Log Video Amplifiers Assembly, A1A3 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R8	1-945027-275	Resistor, fixed, film, 7.15 kilohm, ± 1%, 1/8 W	14674	RN55-D-7151F
R9	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R10	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R11	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R12	1-945027-327	Resistor, fixed, film, 24.9 kilohm, ± 1%, 1/8 W	14674	RN55-D-2492F
R13	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R14	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R15	1-945000-210	Resistor, fixed, composition, 100 kilohm, ±5%, 1/4 W	01121	CB1045
R16	1-945027-390	Resistor, fixed, film, 113 kilohm, ± 1%, 1/8 W	14674	RN55-D-1133F
R17	1-945027-189	Resistor, fixed, film, 909 ohm, ± 1%, 1/8 W	14674	RN55-D-9090F
R18	1-945027-433	Resistor, fixed, film, 316 kilohm, ± 1%, 1/8 W	14674	RN55-D-3163F
R19	1-945162-110	Resistor, variable, cermet, 10 kilohm, ±20%, 1/2 W	01121	E4A103
R20	1-945000-172	Resistor, fixed, composition, 2.7 kilohm, ± 5%, 1/4 W	01121	CB2725
R21	1-945162-109	Resistor, variable, cermet, 5 kilohm, ± 20%, 1/2 W	01121	E4A502
R22	1-945027-251	Resistor, fixed, film, 4.02 kilohm, ± 1%, 1/8 W	14674	RN55-D-4021F

Table 9-8. Parts List for Linear and Log Video Amplifiers Assembly, A1A3 (continued)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R23	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R24	1-945027-234	Resistor, fixed, film, 2.67 kilohm, ± 1%, 1/8 W	14674	RN55-D-2671F
R25	1-945000-258	Resistor, fixed, composition, 10 megohm, ± 5%, 1/4 W	01121	CB1065
R26	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R27	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R28	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R29	1-945000-210	Resistor, fixed, composition 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R30	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R31	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R32	1-945000-234	Resistor, fixed, composition, 1 megohm, ± 5%, 1/4 W	01121	CB1055
R33	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R34	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R35	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R36	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045

Table 9-8. Parts List for Linear and Log Video Amplifiers Assembly, A1A3 (continued)

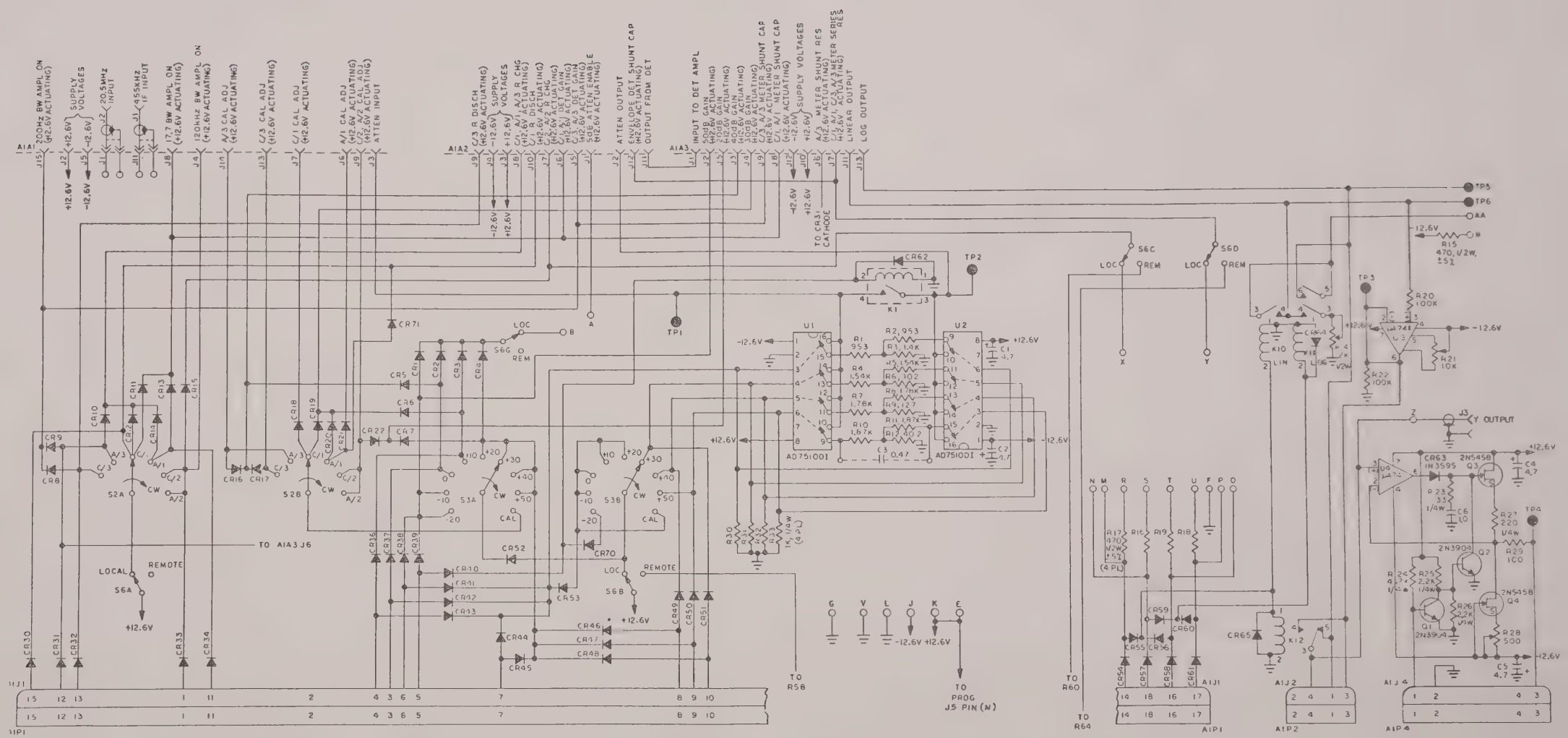
Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
R37	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R38	1-945163-110	Resistor, variable, cermet, 10 kilohm, ± 10%, 1/2 W	02111	64Y103T000
R39	1-945163-110	Resistor, variable, cermet, 10 kilohm, ± 10%, 1/2 W	02111	64Y103T000
R40	1-945000-185	Resistor, fixed, composition, 9.1 kilohm, ± 5%, 1/4 W	01121	CB9125
R41	1-945000-186	Resistor, fixed, composition, 10 kilohm, ± 5%, 1/4 W	01121	CB1035
R42	1-945000-252	Resistor, fixed, composition, 5.6 megohm, ± 5%, 1/4 W	01121	CB5655
R43	1-945000-195	Resistor, fixed, composition, 24 kilohm, ± 5%, 1/4 W	01121	CB2435
R44	1-945163-111	Resistor, variable, cermet, 20 kilohm, ± 10%, 1/2 W	02111	64Y203T000
R45	1-945000-210	Resistor, fixed, composition, 100 kilohm, ± 5%, 1/4 W	01121	CB1045
R46	1-945000-258	Resistor, fixed, composition, 10 megohm, ± 5%, 1/4 W	01121	CB1065
U1	1-926139-001	Integrated circuit, operational amplifier	02735	CA3140T
U2	1-926036-002	Integrated circuit, operational amplifier	07263	741HC
U3	1-926125-001	Integrated circuit, logarithmic amplifier	13919	4127JG

Table 9-9. Parts List for Power Supply Assembly, A2
(Spec. Controlled, Purchased Item, Listed for Reference Only)

Ref. Desig.	AILTECH Part No.	Description	Mfr. Code No.	Mfr. Part No.
		Assembly, Regulator Board	53279	
		Assembly, Overvoltage Protection Board	53279	OVP-1
T1		Transformer, Power	53279	T1
		NOTE To order parts for the power supply, write to the manufacturer; state model number; part reference number; part description; where used. TYPICAL EXAMPLE: XM15-12 w/ovp DT; C1; 1500 μF 35 V; Regulator Board Assembly.		

SECTION X

SCHEMATIC DIAGRAMS



6. ALL ODD NUMBERED RESISTORS FROM R35 THRU R67 ARE 9.1K OHMS
5. ALL EVEN NUMBERED RESISTORS FROM R34 THRU R66 ARE 1K OHMS.
4. DIODES CR62, 64 & 65 ARE IN4148
3. ALL CAPACITORS ARE IN MICROFARADS
2. ALL DIODES ARE IN277
1. ALL RESISTORS ARE IN OHMS ±1%, 1/8W

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 10-1. Schematic Diagram, Mother Board, A1 Dwg. No. 4-501663-001(C) (Sheet 1 of 3)

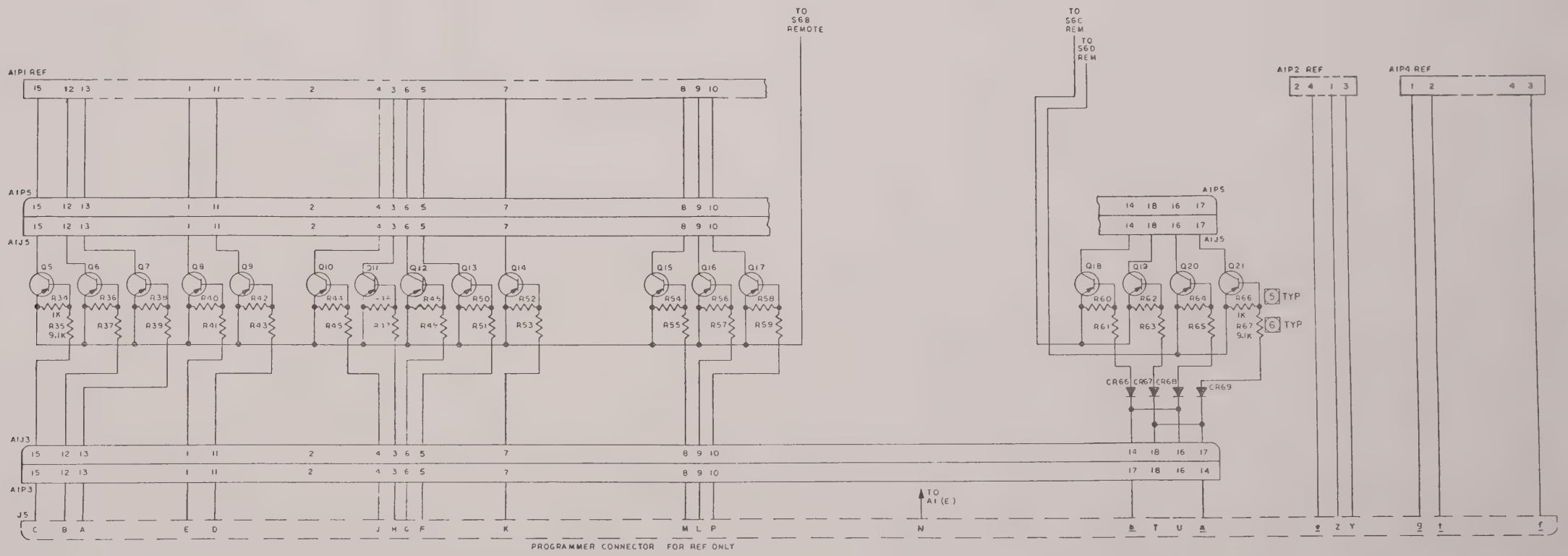


Figure 10-1. Schematic Diagram,
Mother Board, A1
Dwg. No. 4-501663-001(C)
(Sheet 2 of 3)

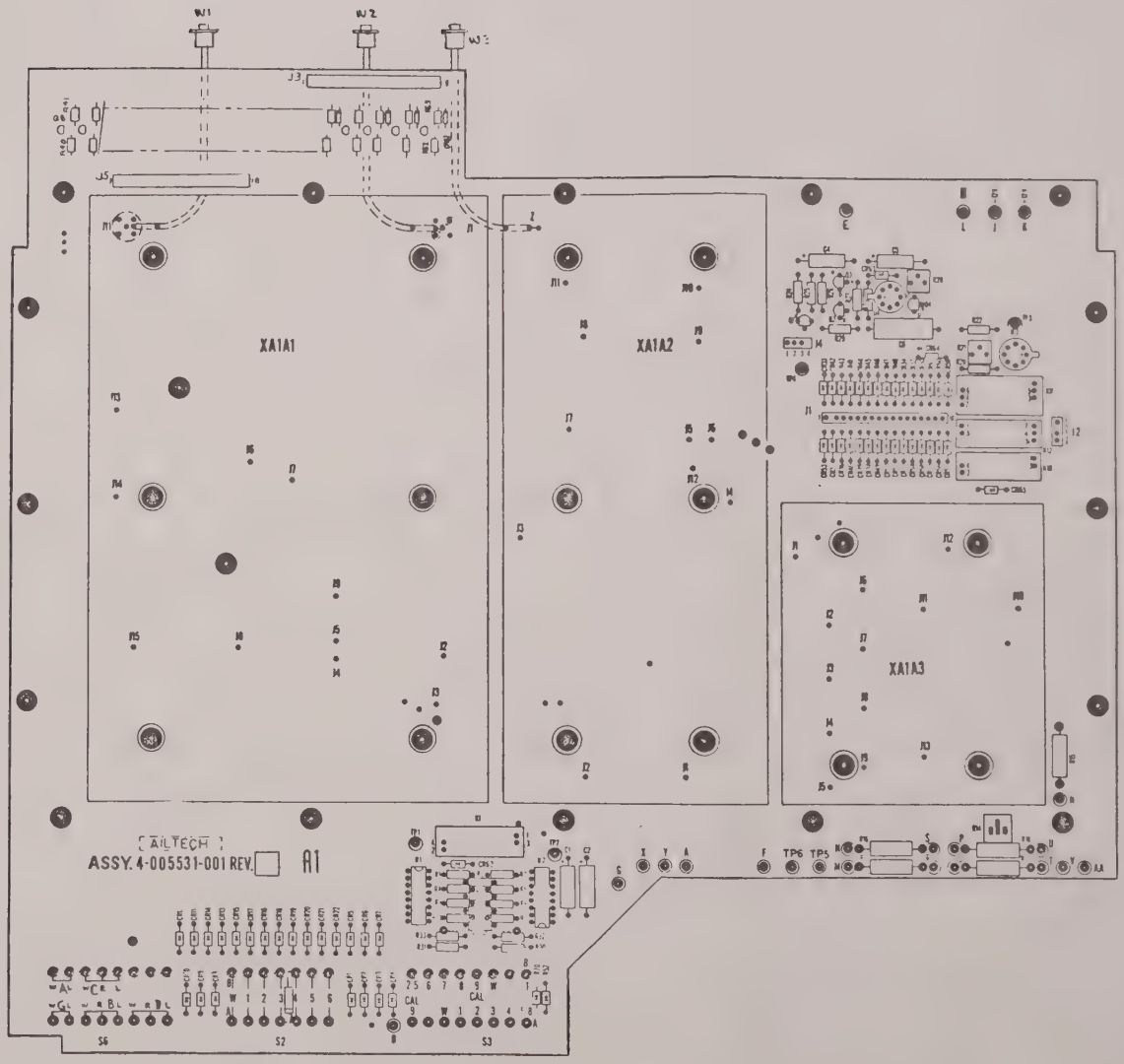
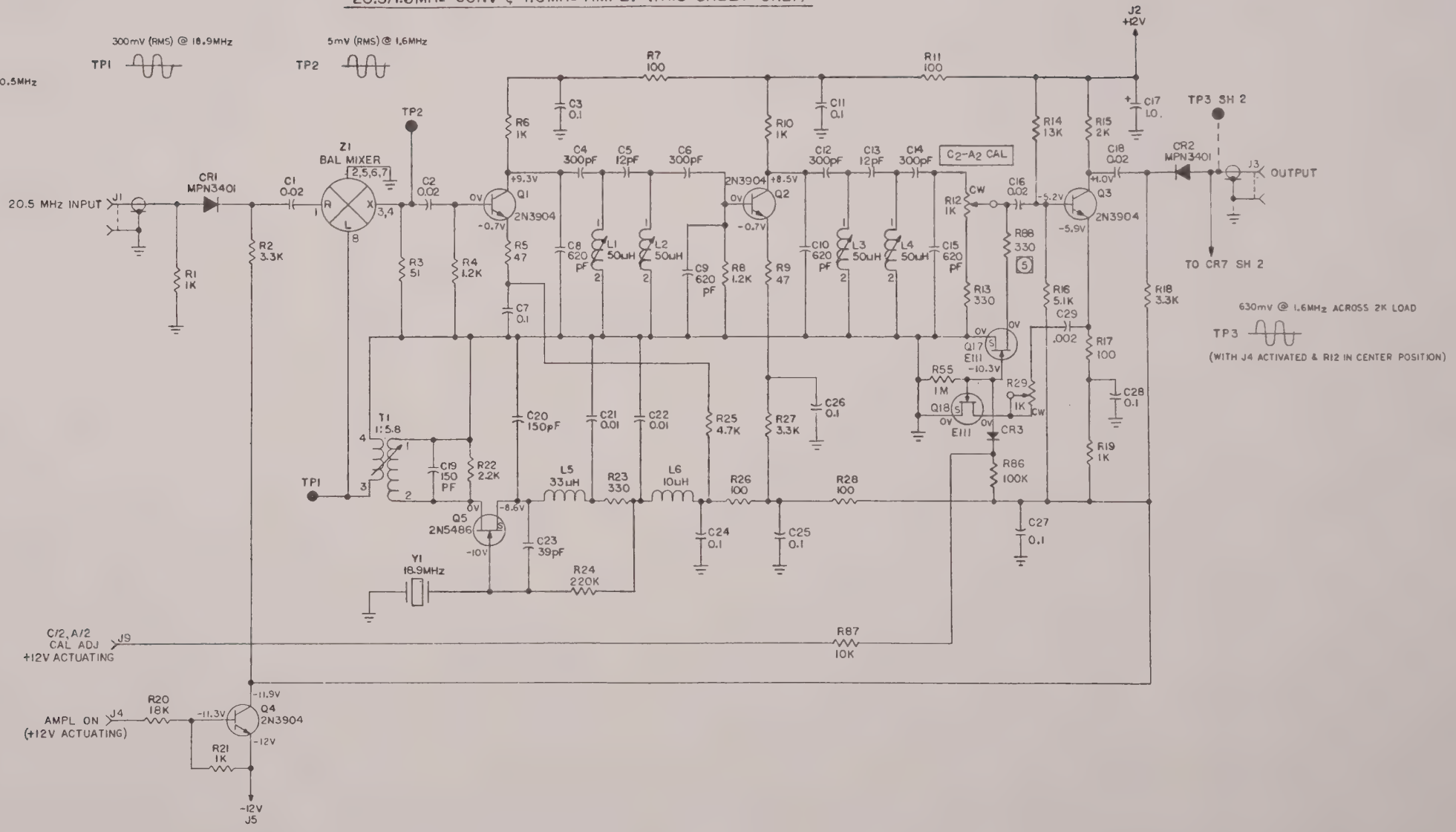


Figure 10-1. Schematic Diagram,
Mother Board, A1
Dwg. No. 4-005531-001(A)
(Sheet 3 of 3)



6 PARTIAL REF. DESIG. ARE SHOWN. FOR COMPLETE DESIGNATOR, PREFIX WITH ASSY NO. A1A1 (EX. A1A1C1)

5 VALUE TO BE SELECTED IN TEST (NOMINAL VALUE SHOWN)

4 TRANSISTOR PIN DIAGRAM, BOTTOM VIEW

D C S G E111 — E B C 2N3904, 2N3906 — D S G 2N5486

3. ALL DIODES ARE 1N4148

2. ALL CAPACITORS ARE IN MICROFARADS.

1. ALL RESISTORS ARE IN OHMS 1/4W, ±5%.

NOTES: UNLESS OTHERWISE SPECIFIED

9 WAVEFORMS SHOWN AT TEST POINTS APPLY ONLY WHEN ACTUATING VOLTAGE IS APPLIED TO J4, J8 OR J15

8 DC VOLTAGES MEASURED WITH NO SIGNAL APPLIED

7 PARTIAL INPUT TERMINOLOGY ARE SHOWN 'A' STANDS FOR ANSI AND 'C' STANDS FOR CISPR.

A/1 = ANSI-1, C/1 = CISPR-1 .15-30MHz; A/2 = ANSI-2, C/2 = CISPR-2 30-1000MHz; A/3 = ANSI-3, C/3 = CISPR-3 10-150kHz

Figure 10-2. Schematic Diagram, IF Converter and IF Amplifiers, A1A1 Dwg. Number 4-501602-001 (Sheet 1 of 3)

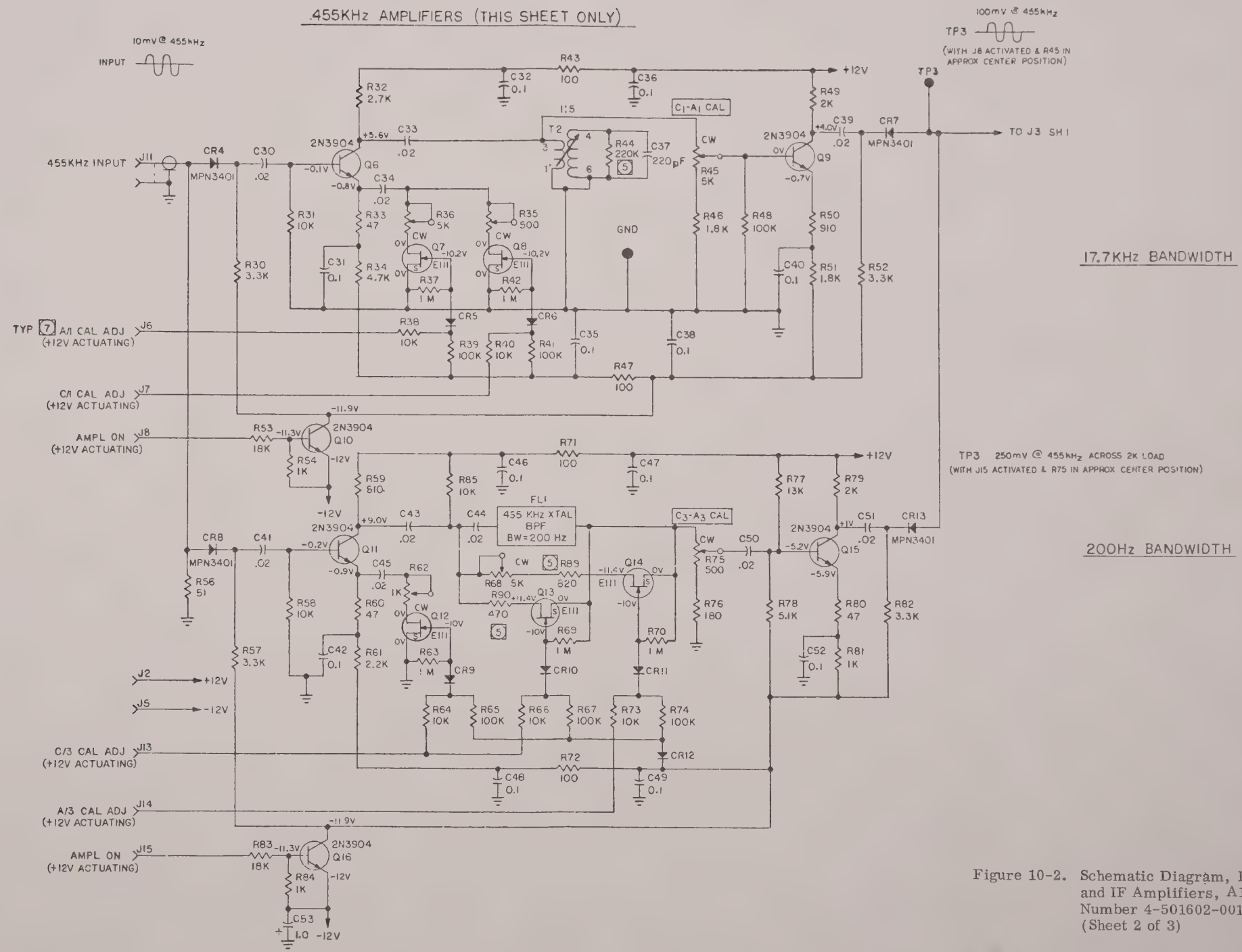


Figure 10-2. Schematic Diagram, IF Converter and IF Amplifiers, A1A1 Dwg. Number 4-501602-001 (Sheet 2 of 3)

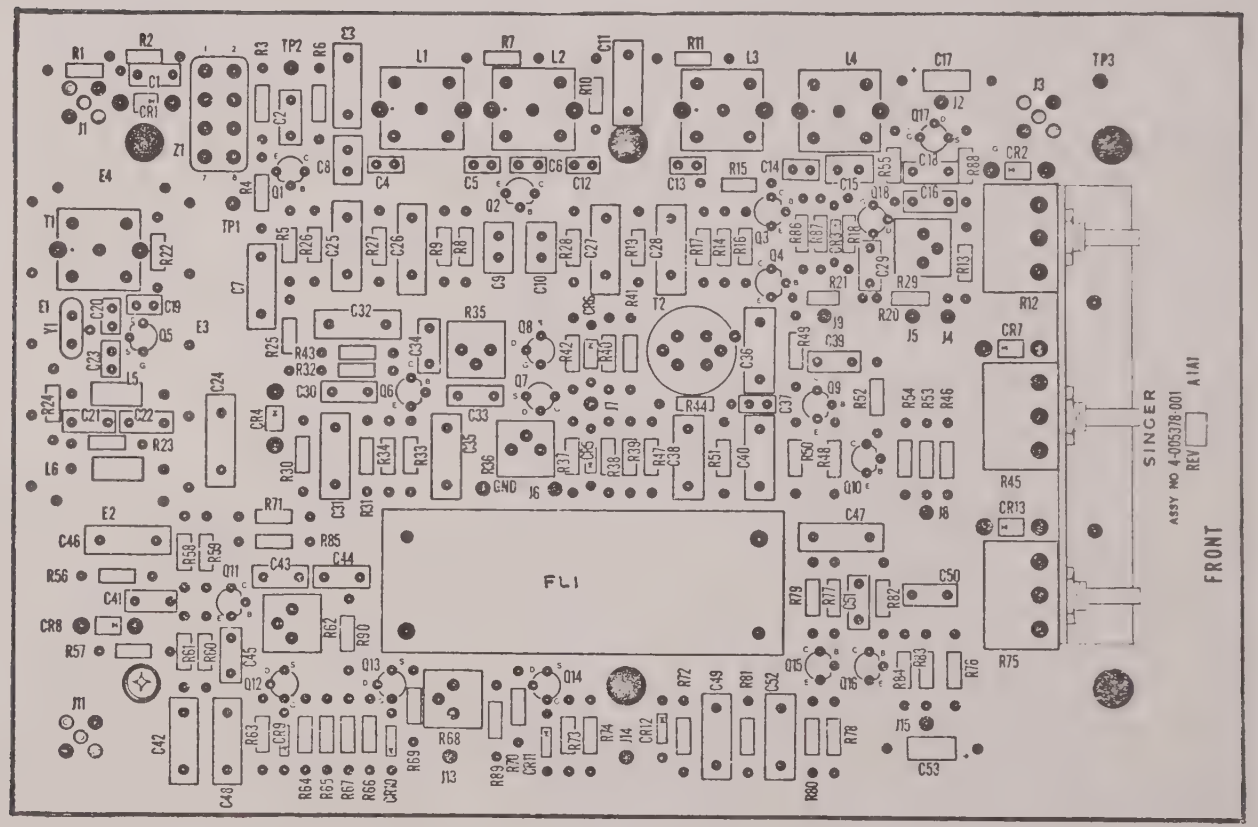
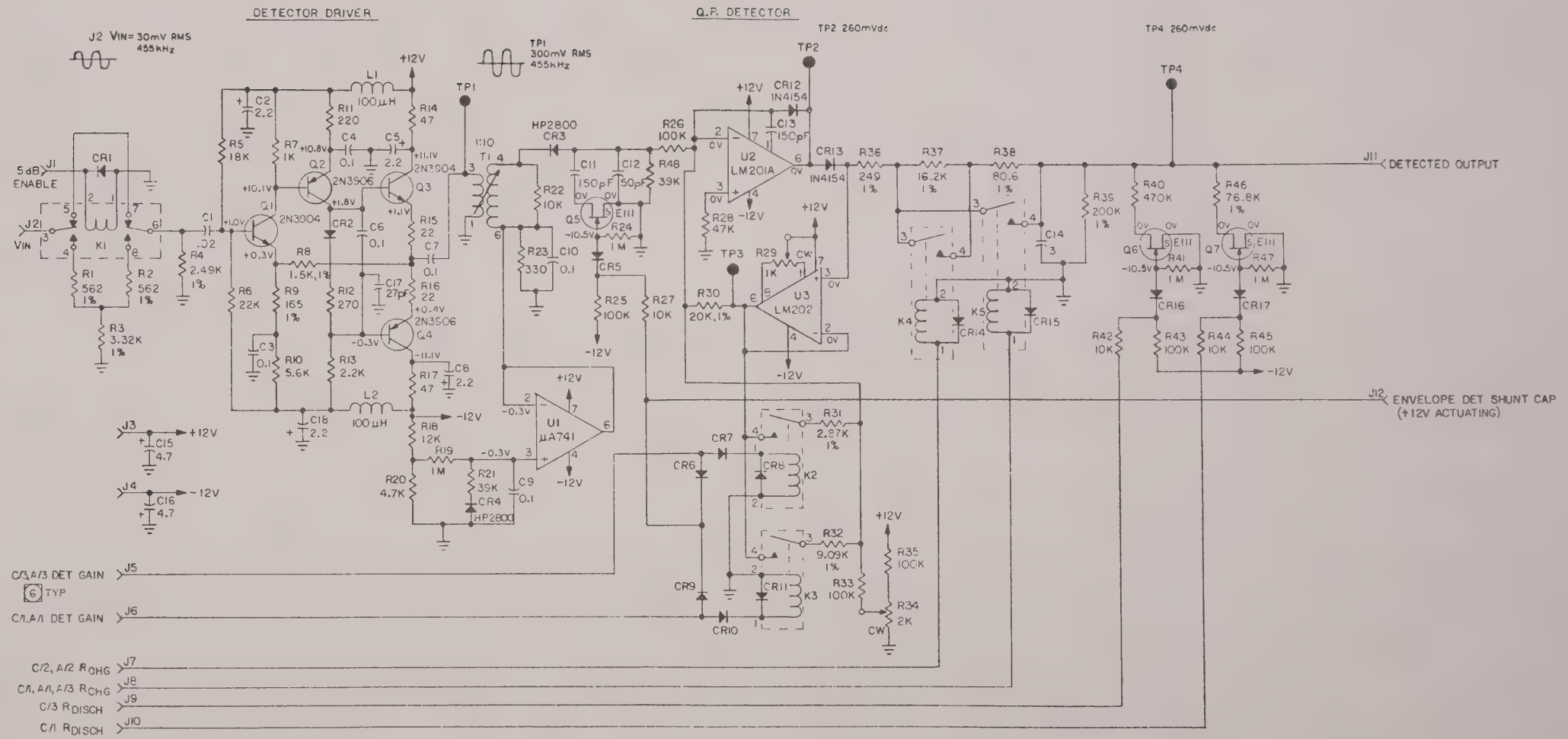


Figure 10-2. Schematic Diagram, IF Converter and IF Amplifiers, A1A1, Dwg. Number 4-005378-001 (Sheet 3 of 3)



7 DC LEVELS MEASURED WITH NO SIGNAL APPLIED

[6] PARTIAL INPUT TERMINOLOGY ARE SHOWN. 'A' STANDS FOR ANSI AND 'C' STANDS FOR CISPR.
A/1 = ANSI-1, C/1 = CISPR-1 } .15-30MHz; A/2 = ANSI-2, C/2 = CISPR-2 } 30-1000MHz; A/3 = ANSI-3, C/3 = CISPR-3 } 10-150kHz

5 PARTIAL REF. DESIG. ARE SHOWN. FOR COMPLETE DESIGNATOR, PREFIX WITH ASSY NO. A1A2 (EX. A1A2C1)

4 TRANSISTOR PIN DIAGRAM, BOTTOM VIEW

E111: D, S, G — 2N3904, 2N3906: E, B, C

3 ALL DIODES ARE IN4148

2 ALL CAPACITOR VALUES ARE IN MICROFARADS

1 ALL RESISTOR VALUES ARE IN OHMS AND ARE 1/4W ±5%

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 10-3. Schematic Diagram, Detector Driver and QP Detector, A1A2 Dwg. Number 4-501601-001 (Sheet 1 of 2)

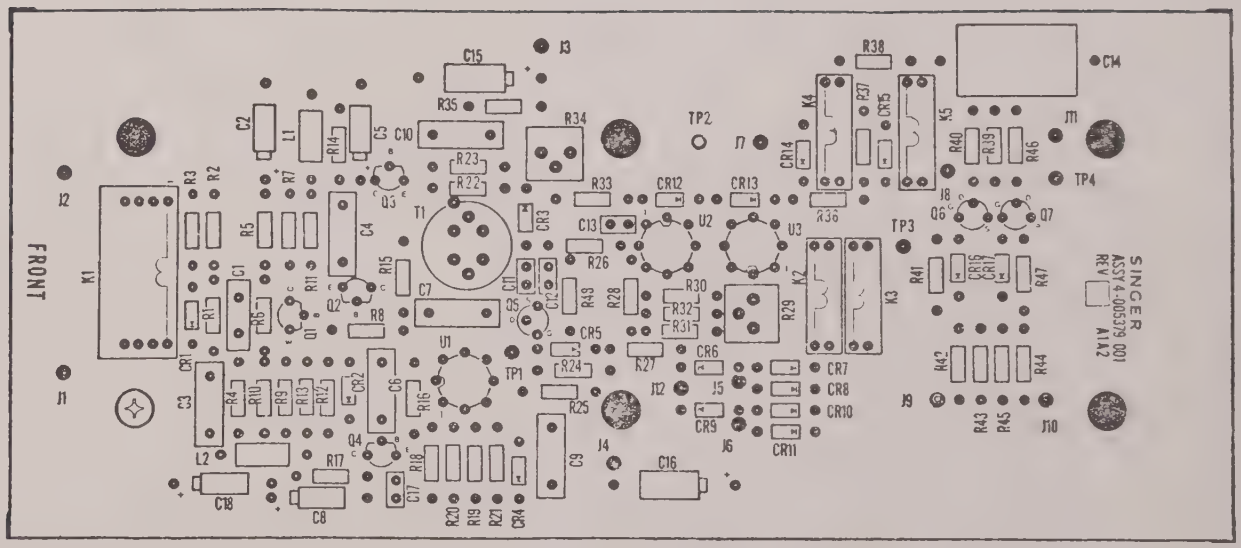


Figure 10-3. Schematic Diagram Detector Driver and QP Detector, A1A2 Dwg. Number 4-005379-001 (Sheet 2 of 2)

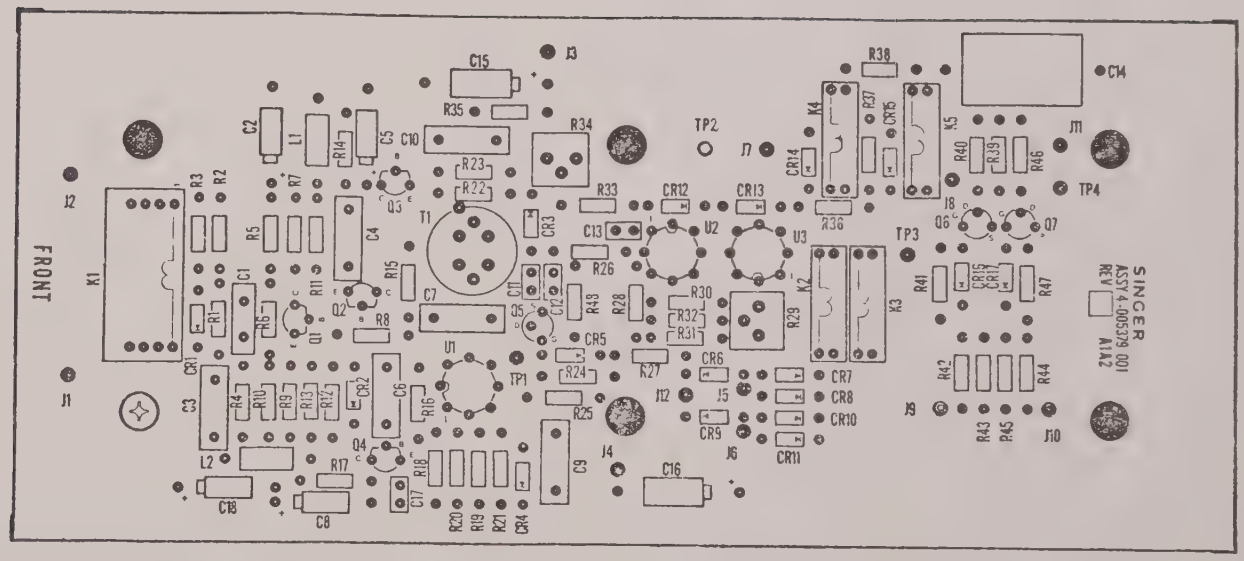
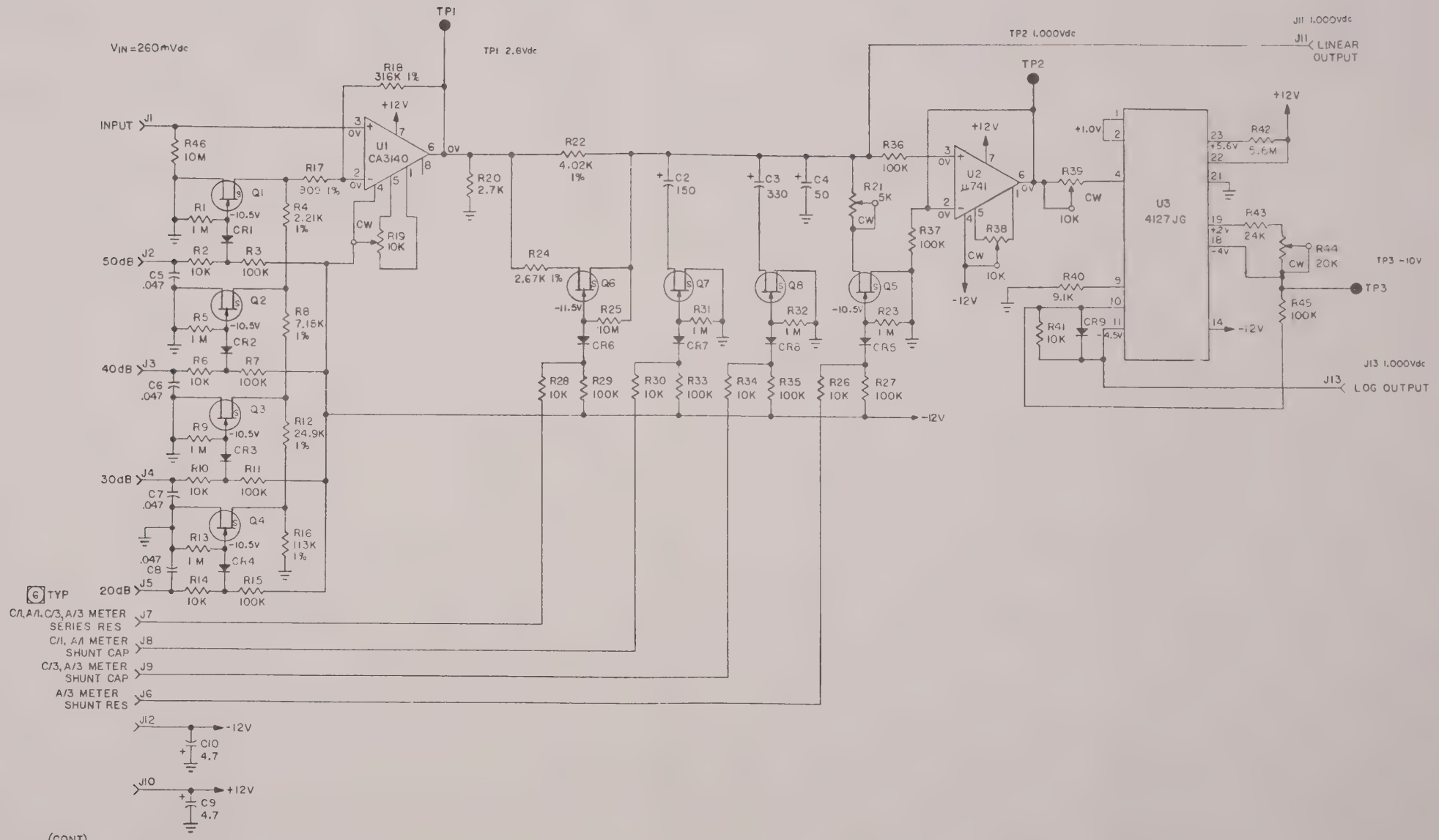


Figure 10-3. Schematic Diagram Detector Driver and QP Detector, A1A2 Dwg. Number 4-005379-001 (Sheet 2 of 2)



(CONT)

7 DC LEVELS MEASURED WITH NO SIGNAL APPLIED

6 PARTIAL INPUT TERMINOLOGY ARE USED. 'A' STANDS FOR ANSI AND 'C' STANDS FOR CISPR.
A/1=ANSI-1, C/1=CISPR-1 } 15-30MHz; A/2=ANSI-2, C/2=CISPR-2 } 30-1000MHz; A/3=ANSI-3, C/3=CISPR-3 } 10-150KHz

5 PARTIAL REF DESIG ARE SHOWN. FOR COMPLETE DESIGNATOR, PREFIX WITH ASSY NO. A1A3 (EX. A1A3C1)

4 ALL FETS ARE E111

3 ALL DIODES ARE IN4148

2 ALL CAPACITORS ARE IN MICROFARADS

1 ALL RESISTORS ARE IN OHMS 1/4W ±5%

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 10-4. Schematic Diagram, Linear and Log Video Amplifier, A1A3, Dwg. Number 4-501603-001 (Sheet 1 of 2)

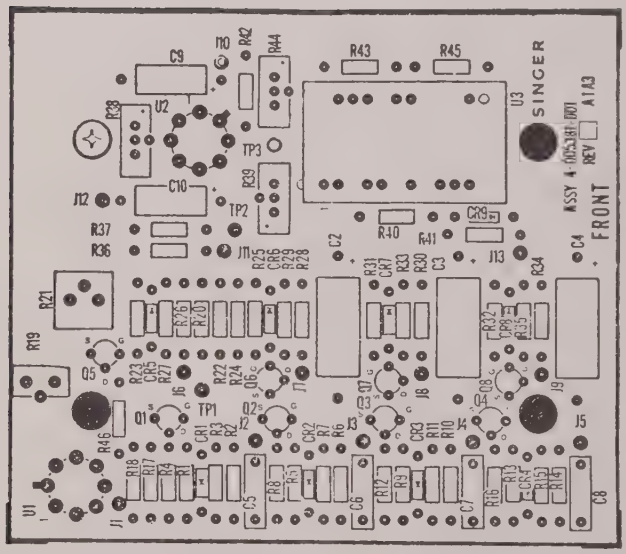
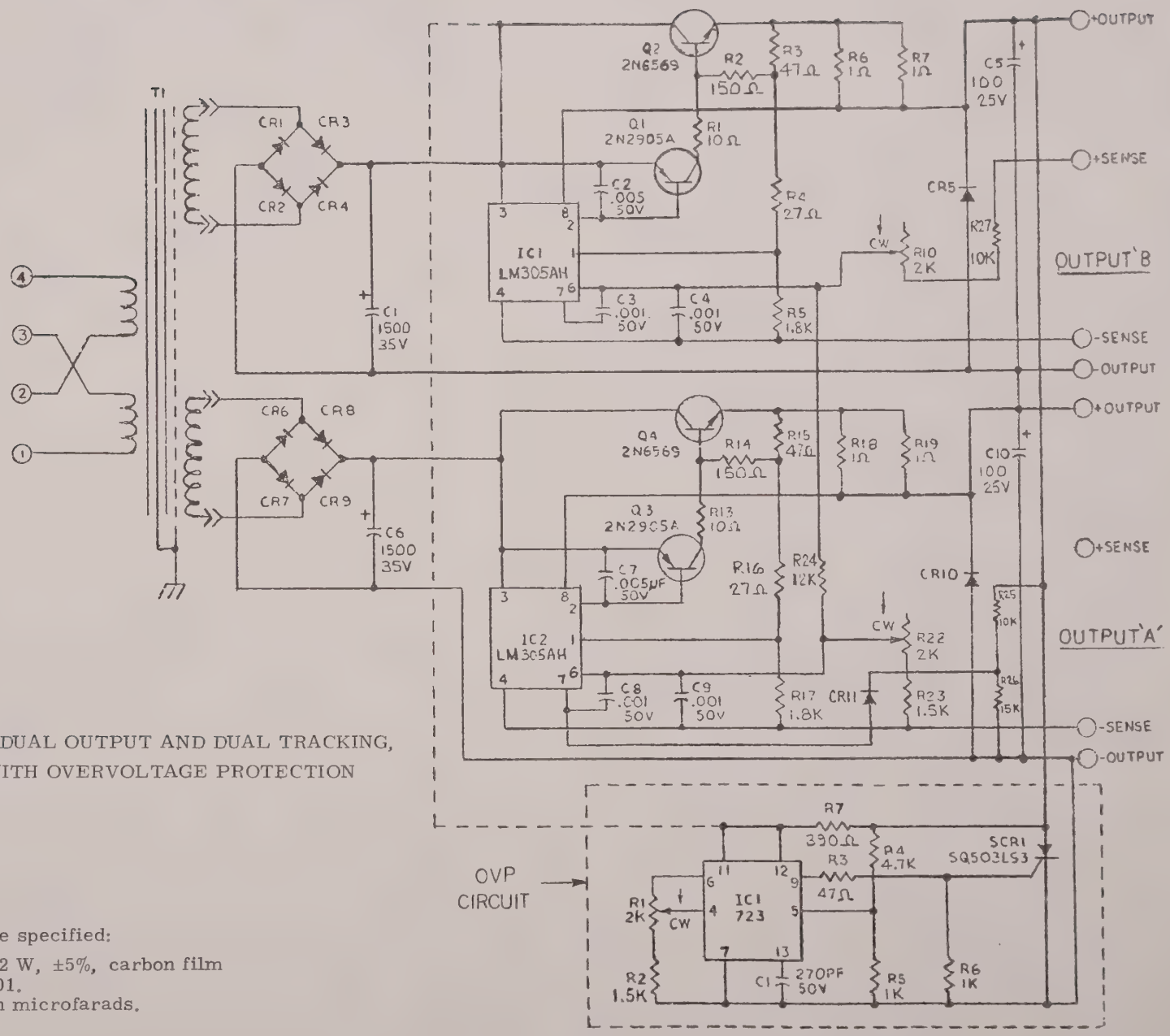


Figure 10-4. Schematic Diagram. Linear and Log Video Amplifiers, A1A3, Dwg. Number 4-005381-001 (Sheet 2 of 2)



±12 V POWER SUPPLY, DUAL OUTPUT AND DUAL TRACKING, MODEL XM 15 SERIES WITH OVERVOLTAGE PROTECTION

NOTES: Unless otherwise specified:

1. All resistors are 1/2 W, ±5%, carbon film
2. All diodes are 1N4001.
3. All capacitors are in microfarads.

Figure 10-5. Schematic Diagram, Power Supply, A2.

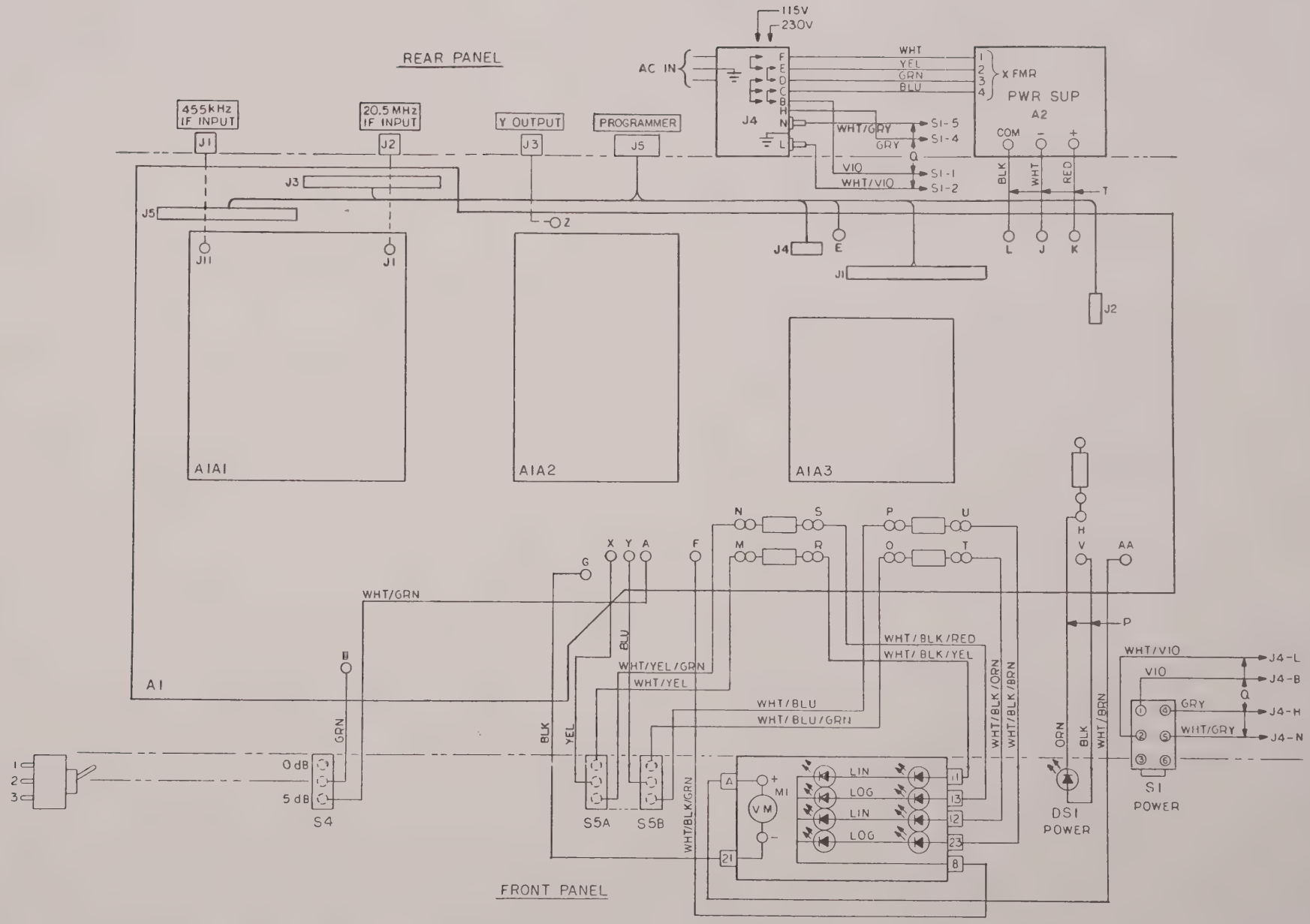


Figure 10-6. Wiring Diagram,
Model CCA-7
Dwg. No. 4-501664-001(A)

Appendix A

PULSE RESPONSE CURVES

Appendix A contains the following pulse response curves:*

Figure A-1: CISPR Pulse Response Curve in the 10-150 kHz frequency range from CISPR Publication 3, Figure 1.

Figure A-2: CISPR Pulse Response Curve in the 0.15-30 MHz frequency range from CISPR Publication 1, Figure 1.

Figure A-3: CISPR Pulse Response Curve in the 30-1000 MHz frequency range from CISPR Publication 2, Figure 1.

Figure A-4: ANSI Pulse Response Curve at 1 MHz from ANSI Specification C63.2, Figure 4**. In the 15 kHz-30 MHz frequency range, the ANSI pulse response versus PRF is specified only at 1 MHz.

Figure A-5: ANSI Pulse Response Curve in the 20-400 MHz frequency range from ANSI Specification C63.3, Figure 2A**. The pulse response curve in the frequency range B (400-1000 MHz) deviates from the curve in the frequency range A (20-400 MHz) because range B applies to a bandwidth of 420 kHz. Since the CCA-7 does not include a 420 kHz bandwidth but uses 120 kHz bandwidth in the entire frequency range of 30-1000 MHz, Figure 2A of the ANSI Specification C63.3 has been extended to 1000 MHz.

* Refer to Appendix B and Figure B-2 for a description of a Universal Pulse Response curve.

** In the ANSI Specifications, the pulse response curves show the relative response of a linear scale versus PRF. To make them compatible with the CISPR curves they were redrawn using a dB scale.

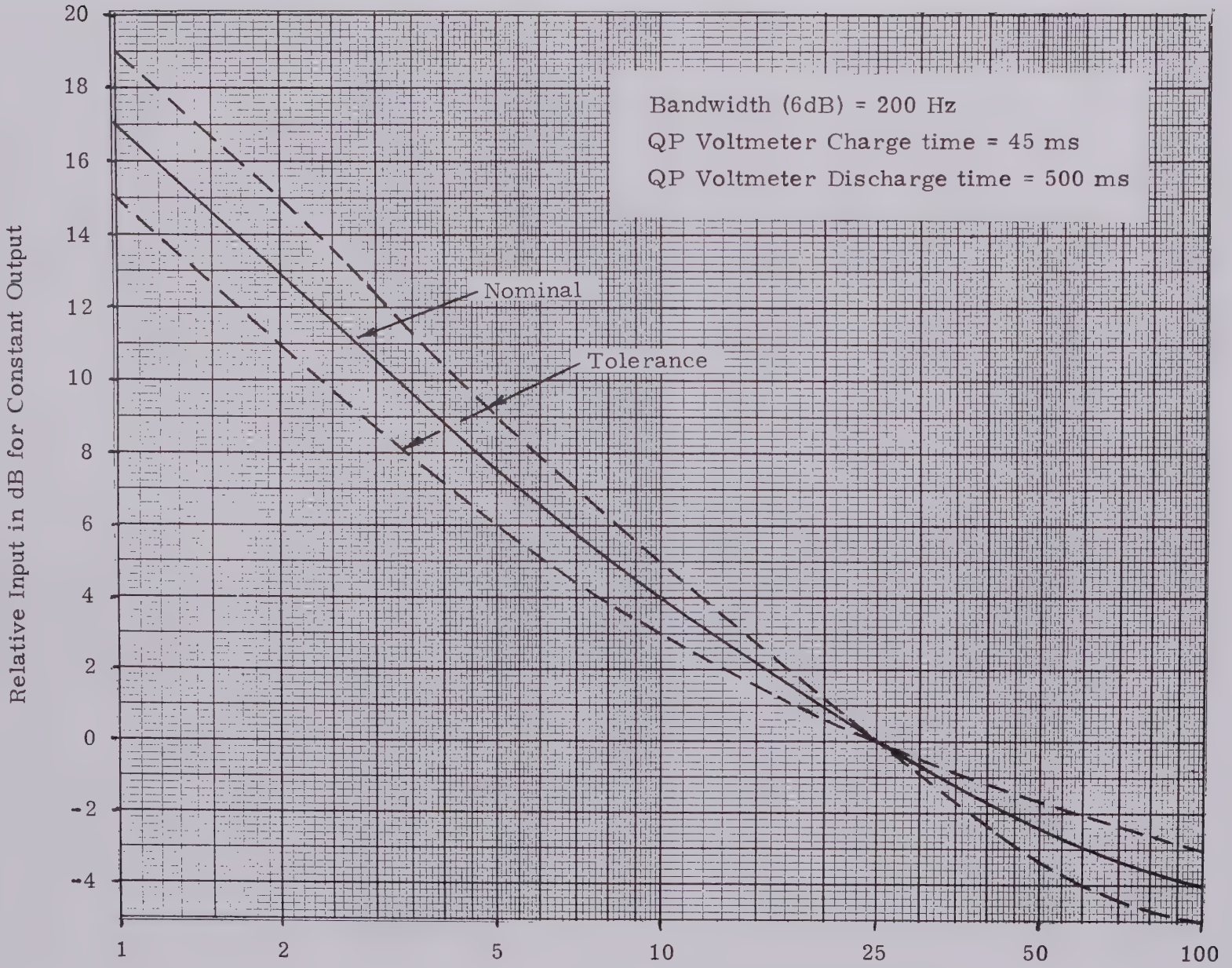


Figure A-1. CISPR Pulse Response Curve, 10-150 kHz from Publication 3

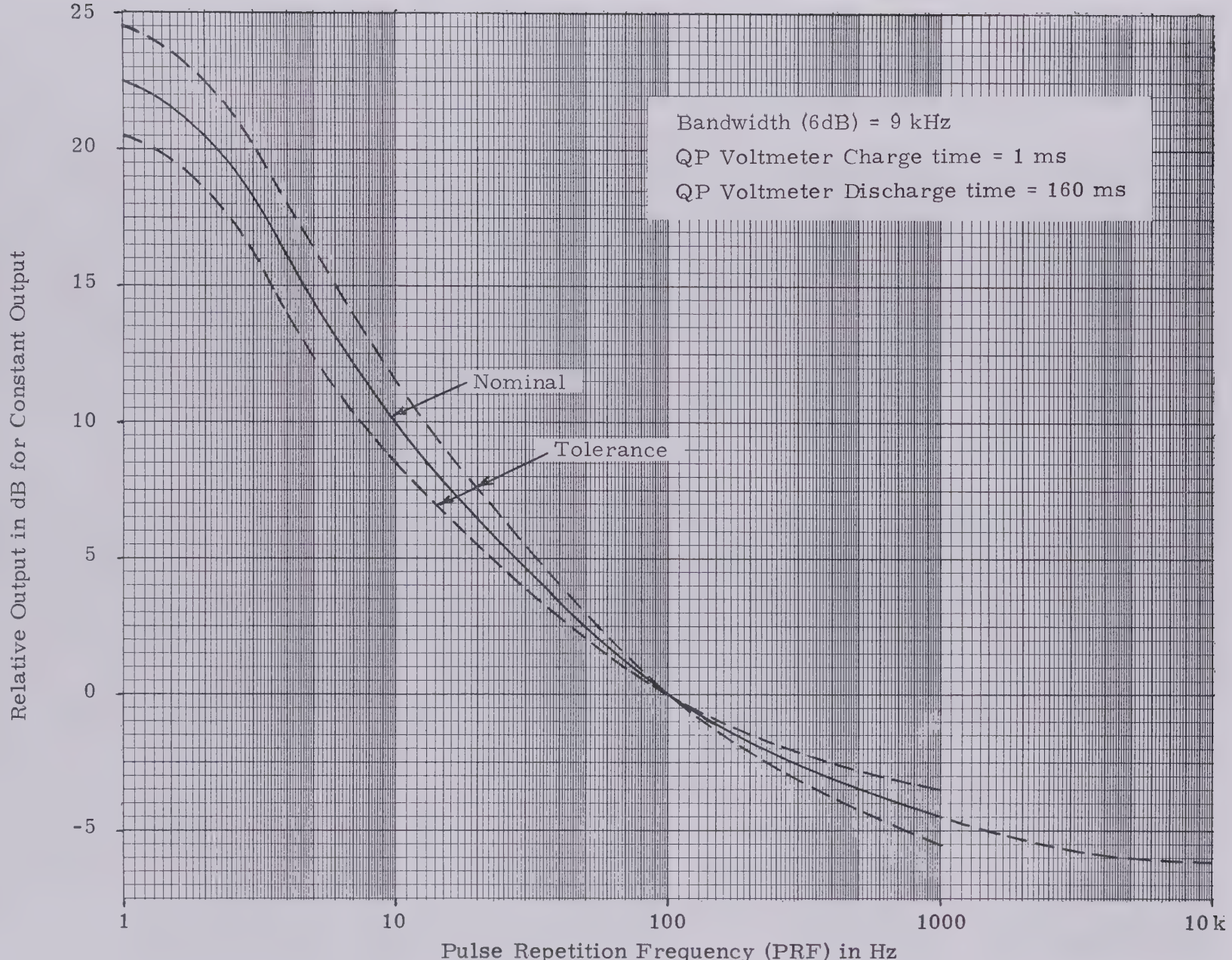


Figure A-2. CISPR Pulse Response Curve, 0.15-30 MHz from Publication 1

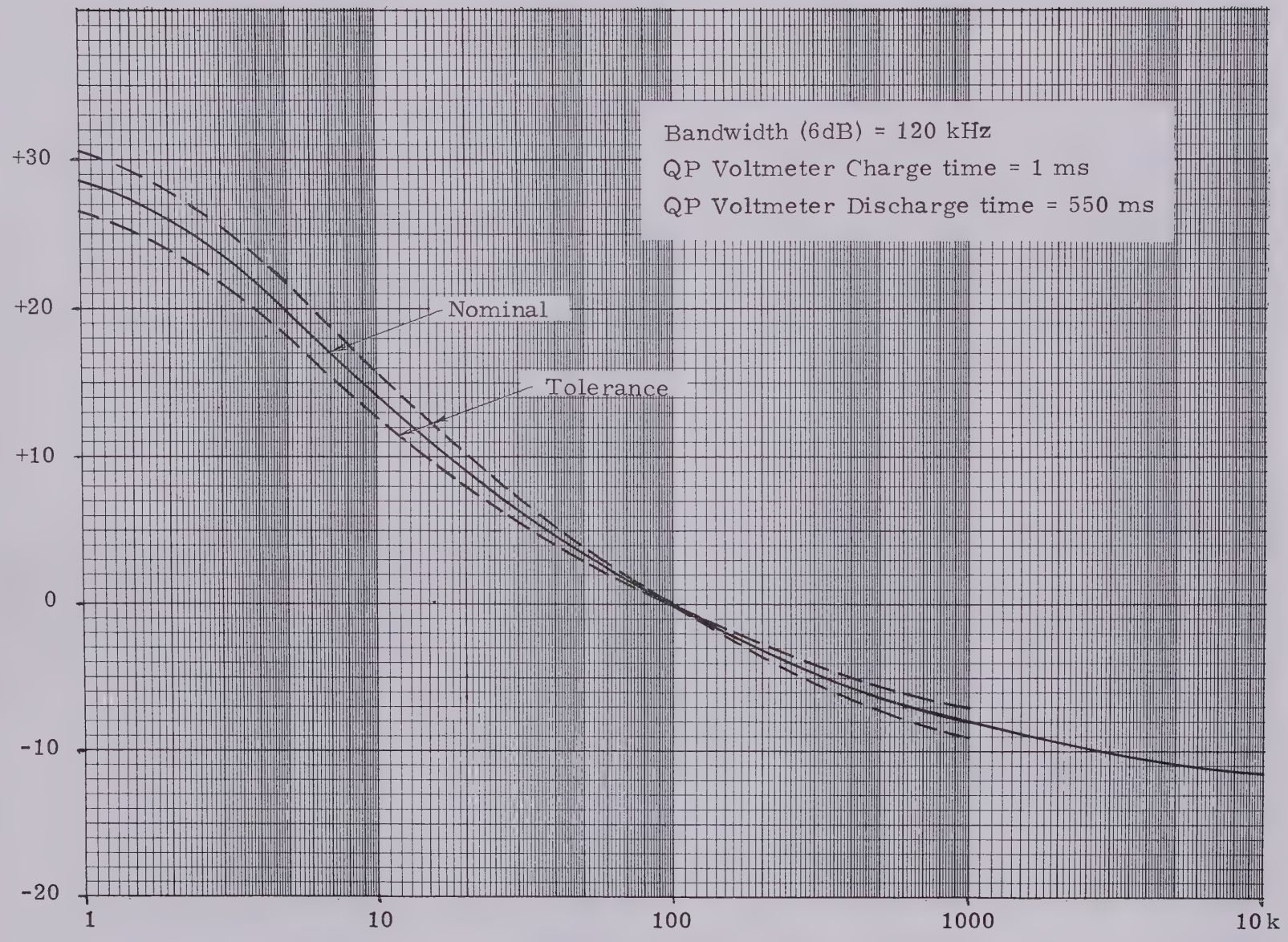


Figure A-3. CISPR Pulse Response Curve, 25-1000 MHz from Publication 2

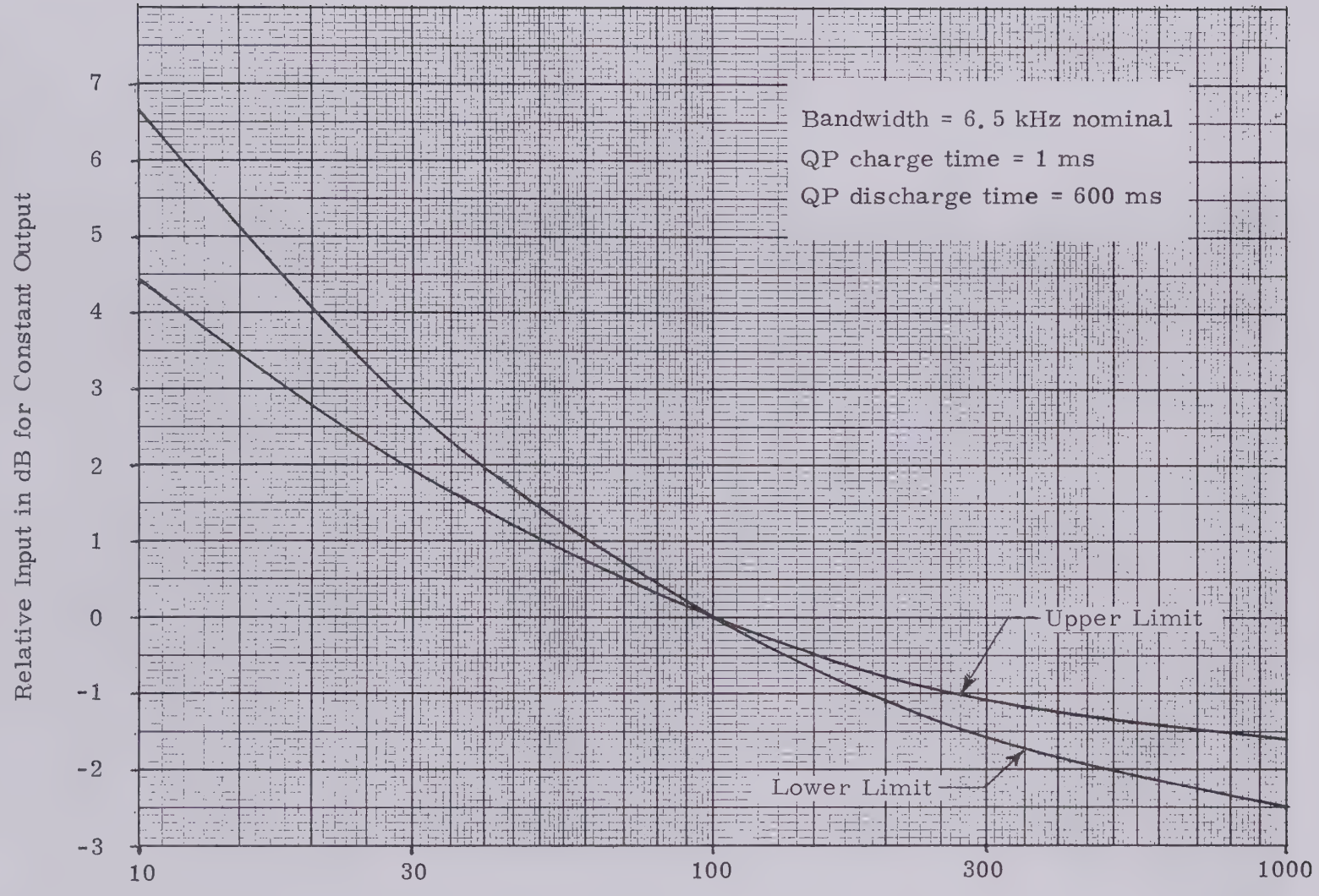


Figure A-4. ANSI Response Curve at f = 1 MHz
Derived from C 63.2

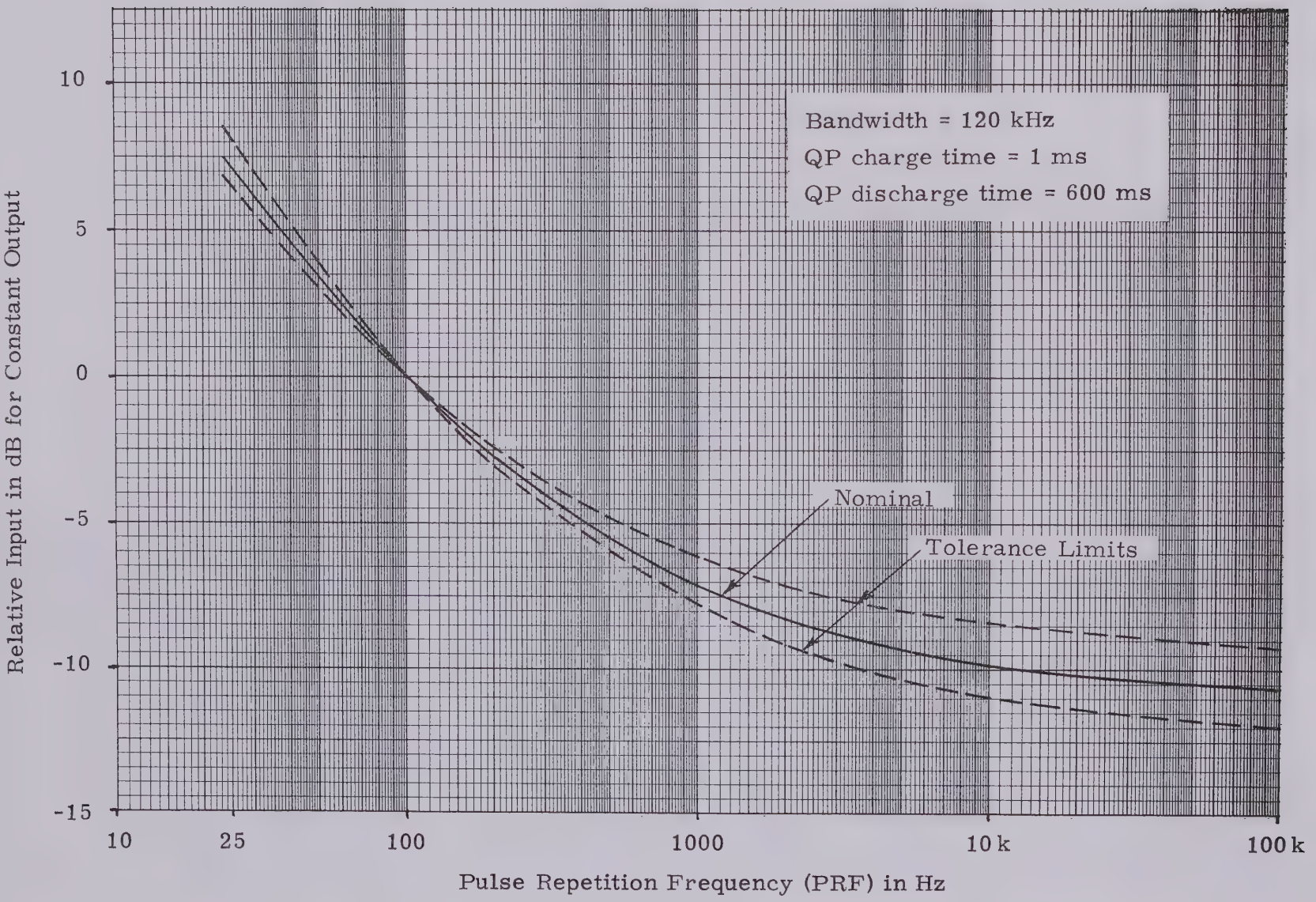


Figure A-5. ANSI Pulse Response Curve 20-400 MHz from C 63. 3

Appendix B

PULSE RESPONSE OF LINEAR AND LOGARITHMIC IF AMPLIFIERS

Applying a short pulse to a narrowband linear amplifier containing 10 or more single tuned circuits or containing 2 or more critically coupled double tuned circuits, the response is a burst with a Gaussian envelope as shown in Figure B-1 (Refer to University of Pennsylvania Report #39).

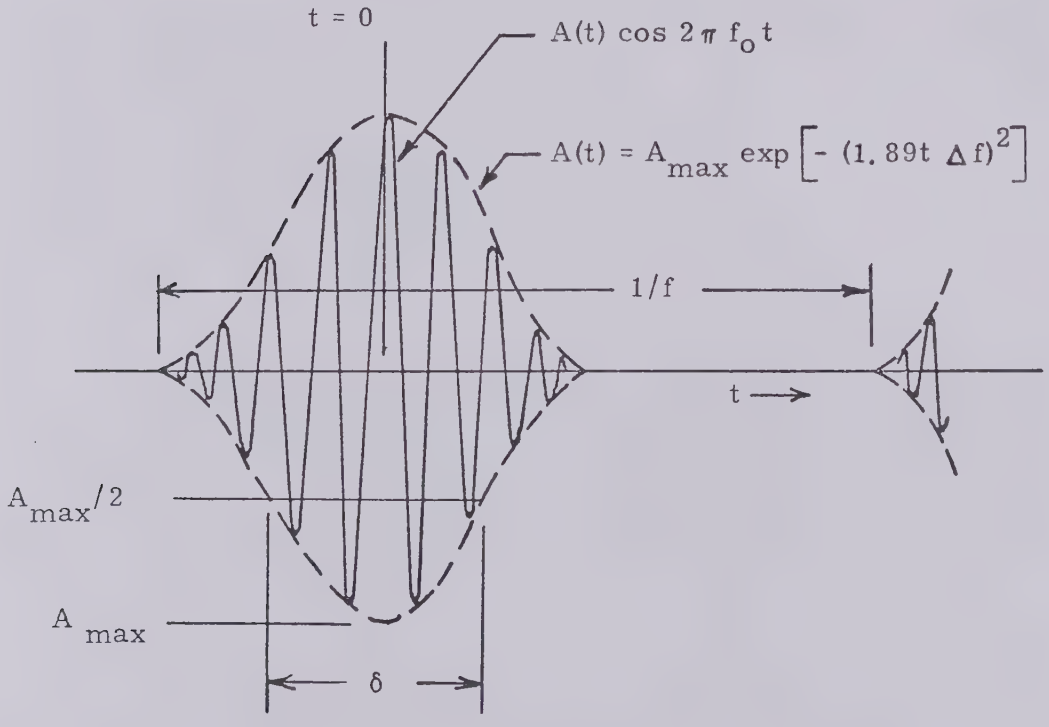


Figure B-1. Pulse Response of a Linear Narrowband Amplifier

The equation of the envelope: $A = A_{max} \exp\left[-(1.89\, t\, B)^2\right]$ where B = overall 6 dB bandwidth. The peak of the envelope occurs at t = 0 and the curve is symmetrical to the t = 0 line. The pulse response duration: $\delta \simeq \frac{1}{B}$.

Applying repetitive short pulses to an IF amplifier tuned to f_o, the response is a burst train. It is assumed that the pulse repetition rate f is $<<$ B so that no overlap of successive pulses occurs. It is further assumed that $f_o >> B$; that means there is a large number of IF cycles in each impulse response envelope. When such a pulse train is applied to a quasi peak detector with a

charge resistor R_C and discharge resistor R_D, the ratio of the quasi peak reading to the peak of the IF envelope is determined in the universal pulse response curve, developed in the Univ. of Penns. Report 39 and presented in Figure B-2. The pulse rectification coefficient $P = \frac{\text{QP response}}{\text{Peak response}} = f(\alpha)$ where $\alpha = \frac{R_D}{R_C} \frac{f}{B}$.

The CISPR pulse response curves are based on the universal pulse response curve, applying the specified charge and discharge time in each frequency range, $T_C = 3.6\ R_C C$, $T_D = R_D C$, C = detector charge condenser. It is obvious that the QP response is a function of the pulse response duration, which is in a linear system proportional to $\frac{1}{B}$.

Applying the output of the same IF amplifier to a logarithmic amplifier ahead of the QP detector, modifies the burst envelope to $\log A = \log A_{max} + \log \exp \left[- (1.89 t B)^2 \right]$. Selecting $A_{max} = 10^4$ and using a factor K=2500 makes $K \log A_{max} = A_{max}$ and enables to plot both pulse envelopes, the response of the linear and logarithmic amplifier with the same amplitude (normalized) on the diagram, Figure B-3. The diagram shows that the pulse response duration of the logarithmic amplifier is considerably longer than that of the linear amplifier. Since the CISPR pulse response curves are based on a linear amplifier, it is obvious that any EMI/FI meter applying an instantaneous logarithmic amplifier ahead of the QP detector can not follow the CISPR specifications.

When the number of tuned circuits in the IF amplifier is less than described above, the envelope of the pulse response is not Gaussian. In this case, the envelope risetime is somewhat shorter and the falltime is somewhat longer than with Gaussian response, yielding the well-known teardrop shaped envelope. The duration of this pulse, however, is close to that of a Gaussian pulse and the pulse response of a QP detector in a linear system is within the tolerances of the CISPR curves. Inserting a log amplifier ahead of the QP detector distorts the teardrop shaped pulse envelope similarly, as it distorted the Gaussian envelope and the QP detector connected to it does not meet the CISPR specifications either.

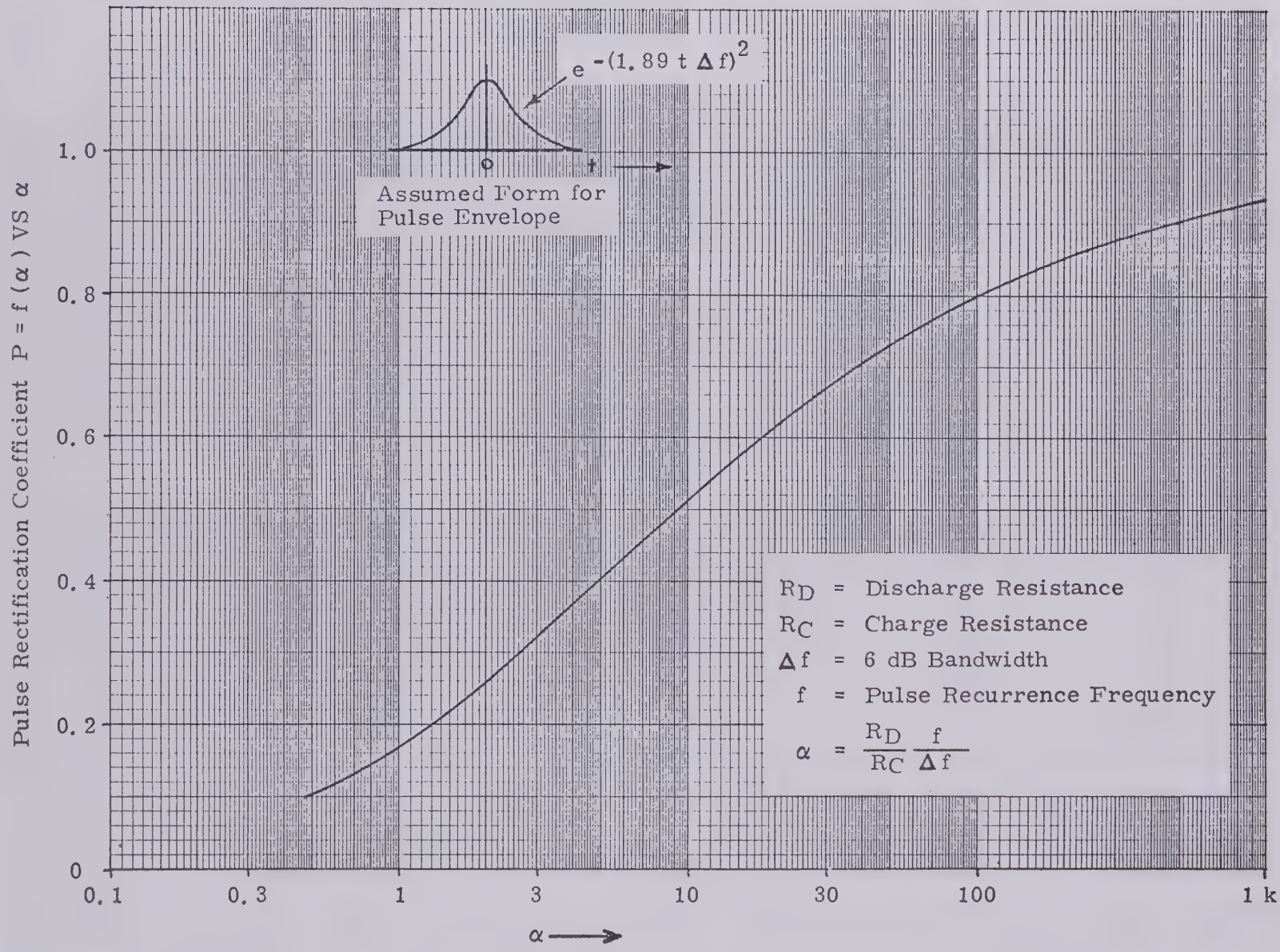


Figure B-2. Universal Pulse Response Curve

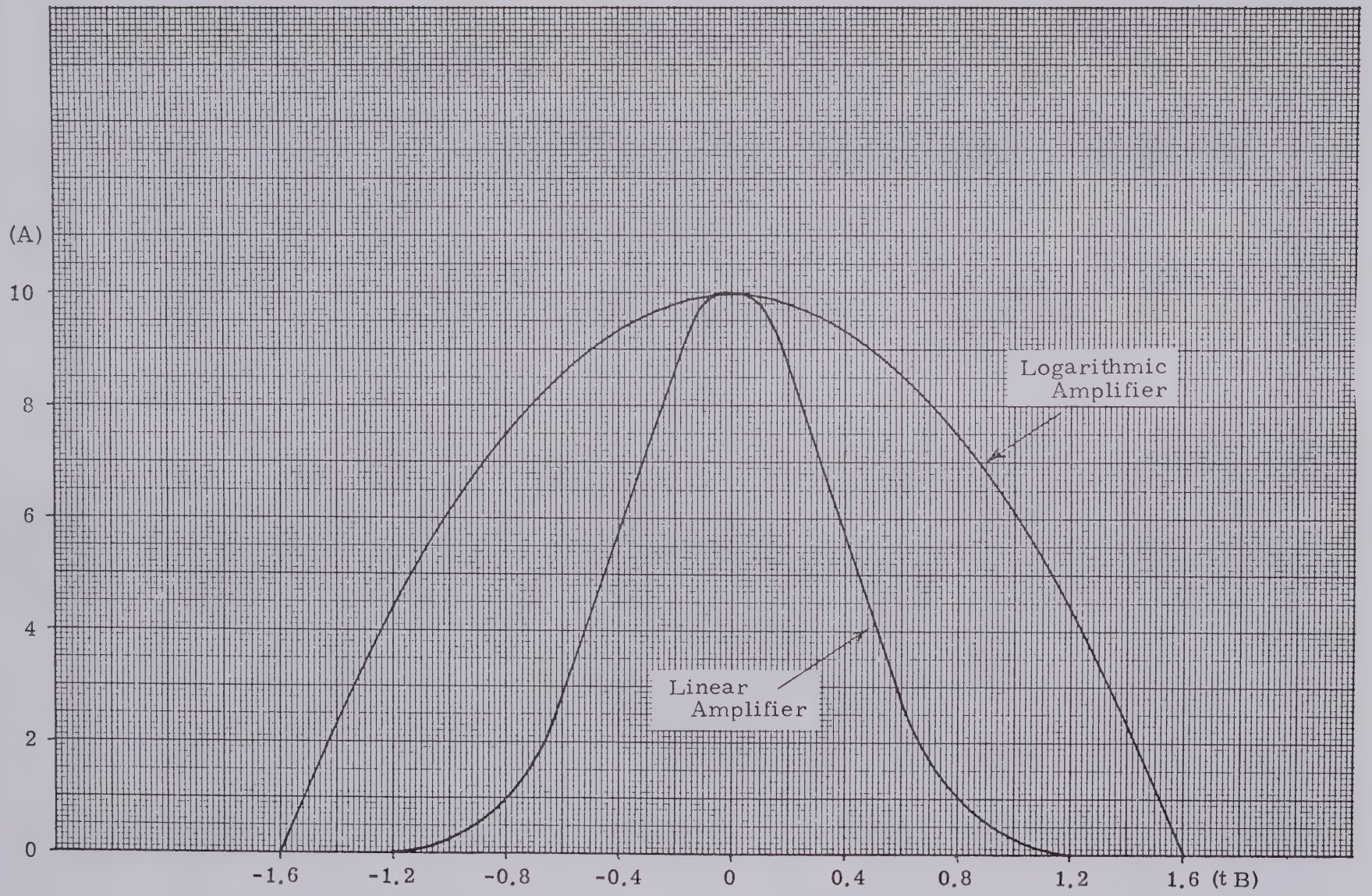


Figure B-3. Pulse Envelope of Linear and Logarithmic IF Amplifiers

Appendix C

CALCULATION OF EQUIVALENT SPECTRAL INTENSITIES

C. 1 Calculation of Equivalent Spectral Intensities in Accordance with CISPR Specifications

The CISPR Publications specify the amplitude relationship of CW signals and pulses at the reference PRF by determining the pulse energy in μVsec which yields the same signal indication as a 2 mV CW signal from a signal generator (open circuit voltage) having the same output impedance as the pulse generator. It follows that if this output impedance is equal to the input impedance of the receiver, the RMS value of the signal at the input to the receiver will be 1 mV. The peak spectral intensity S of a pulse yielding the same signal indication at the reference PRF as a 1 mV CW signal is:

$$S = 2\ (At)\ \mu V\ sec = 2\ (At)\ \mu V/Hz\ peak$$

where: A = Pulse amplitude in μV

t = Pulse duration in seconds

The same spectral intensity can be expressed in μV/MHz terms:

$$S' = S \times 10^6 \text{ peak}$$

Or in dBμV/MHz terms:

$$S' = 20 \log (S \times 10^6) \text{ peak}$$

Most impulse generators are calibrated in terms of RMS spectral intensity. The RMS equivalent of S' (peak) is:

$$S'' = S' - 3 \text{ dB}$$

The equivalent spectral intensity of a 10 μV CW signal (S_{10}) is:

$$S_{10} = S'' - 40 \text{ dB}$$

Table C-1 lists results of calculations of the equivalent spectral intensities at the reference PRF in all frequency ranges of the CCA-7.

MP MASTER
MA34285